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# Comparing Paper-and-Pencil and Web-based Test Results: An Equating Study for AFCT Form 19G

**Zannette A. Uriell**
Navy Personnel Research, Studies, and Technology




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# Comparing Paper-and-Pencil and Web-based Test Results: An Equating Study for AFCT Form 19G

Zannette A. Uriell

Reviewed by
Paul Rosenfeld, Ph.D.
Institute for Organizational Assessment

Approved and Released by
David L. Alderton, Ph.D.
Director



Navy Personnel Research, Studies, and Technology (NPRST/BUPERS-1)
Bureau of Naval Personnel
5720 Integrity Drive
Millington, TN 38055-1000
www.nprst.navy.mil

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The Navy administers tests throughout a Sailor's career. One key test is the Armed Forces Classification Test (AFCT), the in-service version of the Armed Services Vocational Aptitude Battery (ASVAB). This test covers a wide range of topics and results may be used to qualify for a different rating. Traditionally, the AFCT is paper-based, even though the ASVAB is now computer-based. The current study compared paper-based results of the AFCT to those obtained through an internet environment. Six-hundred eighty-nine Sailors at the Navy Training Command took the paper-based version of the AFCT. Another 762 Sailors took the web-based version. Standard scores were computed for each subtest, using the 1997 ASVAB normative scale. Results show that paper scores tended to be slightly higher, noticeably so for the Paragraph Comprehension and the Assembling Objects subtests.

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# Foreword

The Armed Services Vocational Aptitude Battery (ASVAB) is administered to all individuals interested in enlisting into military service. The test covers a range of topics, including automotive and shop knowledge, electronics information, mechanical reasoning, verbal and mathematical ability, and general science information. Scores are used to determine whether a person qualifies for service as well as the likelihood of successfully completing job-specific training, and, by extension, success on the job.

Once a person is in service, Sailors may retake the test to improve their test scores and qualify for a different Navy job. The in-service version of the ASVAB is referred to as the Armed Forces Classification Test (AFCT). It is a retired paper-and-pencil version of the ASVAB. Responses are recorded on "bubble" answer sheets, scored by hand using a stencil overlay. The scale scores are calculated by summing up the number of correct items for a subtest.

Several things occurred to make these procedures impractical. First, the Navy is actively reshaping the force structure, eliminating some jobs and growing others. As a result, many Sailors are being asked to change jobs, which has dramatically increased the number of AFCT administrations. This makes the long, slow, and error prone process of administering, timing, and hand-scoring tests impractical. Secondly, in July 2002, the Navy adopted a new normative reference population to compare test scores against. The new national normative data was collected in 1997 (the old data was from 1980). There are a number of differences between the two populations that substantially change what a score means. For example, a 50 on the 1980 Math Knowledge scale is actually a 52 on the 1997 scale; but a 50 on the 1980 Electronics Information scale is actually a 47 on the 1997 scale. Thus, the AFCT scores need to be on the current score scale. However, there is a further complication. The 1997 scores scales are all based on scoring algorithms using a 3-parameter logistic model from Item Response Theory. Practically speaking, this means that when someone is hand scoring a test, each correct item must be scored using three 5-decimal place numbers in an exponential function, then summed. This is nearly impossible to do correctly by hand for all 225 AFCT test items.

One solution to these problems would be to move the AFCT test onto a computer. A computer-based AFCT could accurately and consistently handle test administration (e.g., each of the 9 subtests are separately timed) and background algorithms could instantly and perfectly score items, estimate subtest scores, and place the summary scores on the 1997 scale. Moreover, the volume of test administrations would have no impact. However, past research has shown that "computerizing" a paper test can inadvertently alter test scores in both large and small ways and differently for demographic groups. This report outlines efforts to create a computer-based version of the AFCT and determine if there are scores differences between the paper and computer based versions.

DAVID L. ALDERTON, Ph.D.
Director

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The author thanks GSCM Christopher K. Knerr, FCCS Douglas S. Berry, and ETCS Ryan N. Biggin for enabling the data collection; FCC Christopher D. Polk, GSM1 Jose Barraza, and MM1 Dae S. Kim for ensuring space for testing; and EM1 Lawrence Palacio and FC2 William T. Griseto for making the data collection as painless as possible. The author also thanks the students at NTC Great Lakes for participating.

Also key to the data collection effort were NPRST volunteer test proctors: Dr. Paul Rosenfeld, Dr. Rosemary Schultz, Ms. Terri Ferraro, Mr. Perry Pena, Mr. Geoff Patrissi, Ms. Carol Newell, Dr. Gerry Wilcove, Ms. Joyce Alexander, Ms. Olivia Puentes, and Mr. Rodney Myers. Programming of the test was done by Ms. Evangeline Clewis and the scoring algorithm was programmed in SAS by Dr. David Alderton. The author also thanks Dr. William Farmer for timely assistance in linear equating.

# Summary


## Problem

Increases in the number of in-service AFCT administrations, the shift to the 1997 score scale, and the necessity of using Item Response Theory scoring methods has made the current AFCT administrative procedures and hand-scoring methods impractical. Administering the AFCT across the Internet may shorten testing time and increase security of test items, and it will reduce scoring errors and produce scores based on the current score scale. This is also in line with Navy initiatives to move more training and testing to the Internet. However, the impact on test scores from moving from a paper-based test to computer-based administration is unknown.

## Objective

The goal of this study is to create a web-based version of the AFCT, then administer both the paper- and web-based versions to personnel and determine if there are substantial differences between test scores across the two modes of administration.

## Approach

Students at Naval Service Training Command, Great Lakes, were assigned to take either the paper- or web-based version based upon the last digit of their Social Security Number; those with even numbers were given the paper version and those with odd numbers were given the web version. Tests were scored and a scale score was created for each respondent. Scale scores were compared for both versions overall as well as by gender and ethnicity (majority vs. minority).

## Findings

1. Web AFCT as programmed was stable; the only issue was related to lost connectivity to the server.
2. Paper-based scores tended to be slightly higher, especially for Paragraph Comprehension and Assembling Objects.
3. Larger differences between versions were seen for women than men, possibly due to the small number of women participants.
4. Both majority and minority groups showed differences in scores obtained from the two versions, and a similar pattern was shown in the overall findings.

## Recommendations

1. AFCT can be administered across the web, but a concept of operations for Fleet-wide administration needs to be determined. For example:
    a. Where should the test software be hosted?
    b. How can a version of the test be made available to deployed ships and submarines?
2. Determine if small point differences between the two versions can be considered negligible.
3. Consider improvements to web-based layout, such as:
    a. Increased font size and different fonts for Paragraph Comprehension display.
    b. Find way to allow web-based respondents to "write" on the displayed graphics for Mechanical Comprehension and Assembling Objects subtests.
4. Replicate equating study with larger group.

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# Introduction

## Problem and Background

Before entering the Navy, potential recruits complete the Armed Services Vocational Aptitude Battery (ASVAB). This test consists of nine subtests covering a wide variety of subjects as shown in Table 1. If not taking a computerized, adaptive version of the ASVAB, each subtest has a specific number of questions and a time limit, also indicated in Table 1.

**Table 1**
**ASVAB Subtests**

| Subtest | Topics | Number of questions | Time Limit |
|---|---|---|---|
| General Science (GS) | Life science, earth and space science, and physical science | 25 | 11 |
| Arithmetic Reasoning (AR) | Arithmetic word problems | 30 | 36 |
| Word Knowledge (WK) | Synonyms | 35 | 11 |
| Paragraph Comprehension (PC) | Extracting information from paragraphs | 15 | 13 |
| Mathematics Knowledge (MK) | Mathematical concepts and applications | 25 | 24 |
| Electronics Information (EI) | Electrical current, circuits, devices, and electronic systems | 20 | 9 |
| Automotive and Shop Information (AS) | Automotive maintenance and repair, wood and metal shop practices | 25 | 11 |
| Mechanical Comprehension (MC) | Mechanical devices, structural support, and properties of materials | 25 | 19 |
| Assembling Objects (AO) | Spatial visualization | 25 | 15 |

The military service branches may opt to include additional subtests. Previous tests have included Coding Speed (finding information in a table quickly) and Numerical Operations (rapidly computing simple mathematical calculations).

The ASVAB is administered at Military Entrancing Processing Stations (MEPS) as part of the formal processing for acceptance into any enlisted military position. The test results will be used to intellectually qualify an applicant for service and then used by classifiers to determine an applicant's suitability for a specific job. Within the Navy, this classification to jobs—or Navy ratings—is based upon optimally formed composites of

ASVAB subtests and "cut-scores"[1] which have been found to predict success in job training schools. The ASVAB composites and cut-scores are periodically re-evaluated to ensure that the most optimal ASVAB standard is used for each school (see, e.g., Held & Monzon, 1991).

Once in the military, a version of the ASVAB called the Armed Forces Classification Test (AFCT) may be administered to personnel who are interested in changing their job, allowing personnel the opportunity to improve their scores to qualify for their desired job. The AFCT is a retired version of the ASVAB. At present, it is only available in paper format, which in normal operational settings means it must be hand scored. However, today's ASVAB subtests are exclusively scored using a 3-parameter logistics (3PL) Item Research Theory (IRT) model which increases the precision of measurement. Practically speaking, this means that when someone is hand scoring a test, each correct item must be scored using three 5-decimal place numbers in an exponential function, then summed. This is nearly impossible to do correctly by hand for all 225 AFCT test items. (IRT scoring was used in this project for both the paper-based and computer-based versions.)

### Objective

This report describes an effort undertaken to create a web-based AFCT and determine if there were differences in scores between the paper- and web-based versions. Of particular interest were comparisons of scores for males, females, majority-ethnicity personnel, and minority-ethnicity personnel.

## Approach

### Test Instruments

The paper AFCT booklet contains 4 to 10 questions per page, depending upon the subtest. Examinees mark their selected answer on a standard scantron ("bubble") answer sheet. Examinees are not allowed to continue to subsequent subtests until time is up or until test administrators determined by a show of hands that all examinees had completed a subtest. All testing materials were collected before examinees were dismissed.

The web-based version was programmed using WebQuiz XP (SmartLite Software, Inc.). Each subtest was created individually. All questions were typed into WebQuiz XP and then verified by two individuals for accuracy. Some subtests (especially MC and AO) contained graphics; these graphics were scanned using a OneTouch 8900 scanner. Every graphic was cleaned in Photoshop 4 to remove any imperfections and then saved as a .png at 96 dpi. Their display sizes were the same as in the paper test booklets.

[1] Classification composites are simple summations of individual subtest scores. If, for example, a composite consists of AR+MC, and a person scored 52 on AR and 61 on MC, their composite score would be 113. If the "cut-score" for qualifying for a particular school is AR+MC = 111, then this person would "make the cut" and be deemed qualified for that school, based on that cut-score.

WebQuiz XP created .mdb files for the questions and the data, and additional .asp files for the actual display of the questions. Before viewing even the instructions for the first subtest, an administrative password was required to ensure that everyone started after the verbal instructions were given. At the bottom of the instructions of the first subtest, an SSN was required to continue to the first question. The .asp files for the succeeding subtests were modified so that this SSN was required to begin and propagated throughout each of the subtests. However, the SSN was "lost" once the next subtest had begun, ensuring that the respondent could not go back to the answers in the previous subtest without having to return to the beginning of the AFCT and reenter an SSN.

Each subtest of the web-based version included the same instructions and sample questions as in the paper condition with just minor wording changes (e.g., "Mark on your answer sheet" became "Click the answer"). The instructions were on-screen and read silently by each examinee, whereas they were read aloud by a proctor for the paper-based version. The instructions were not timed; the timer would start as soon as the first question appeared on screen, similar to the paper process when the timer did not start until turning to the first question.

Figure 1 shows the general screen layout of each question in the web-based version. The title of the subtest was displayed under the Internet Explorer toolbars, the question and answer choices located directly below that, and the timer was in the bottom left corner of the window. Only one question was presented at a time. Within each subtest, the examinee could move forward or backward through the subtest using the "Next" and "Previous" buttons (previous not available on question 1 of each subtest); moving to a different question would retain the person's selected answer. Moving through questions did not impact the timer; it would continue counting down the remaining time.

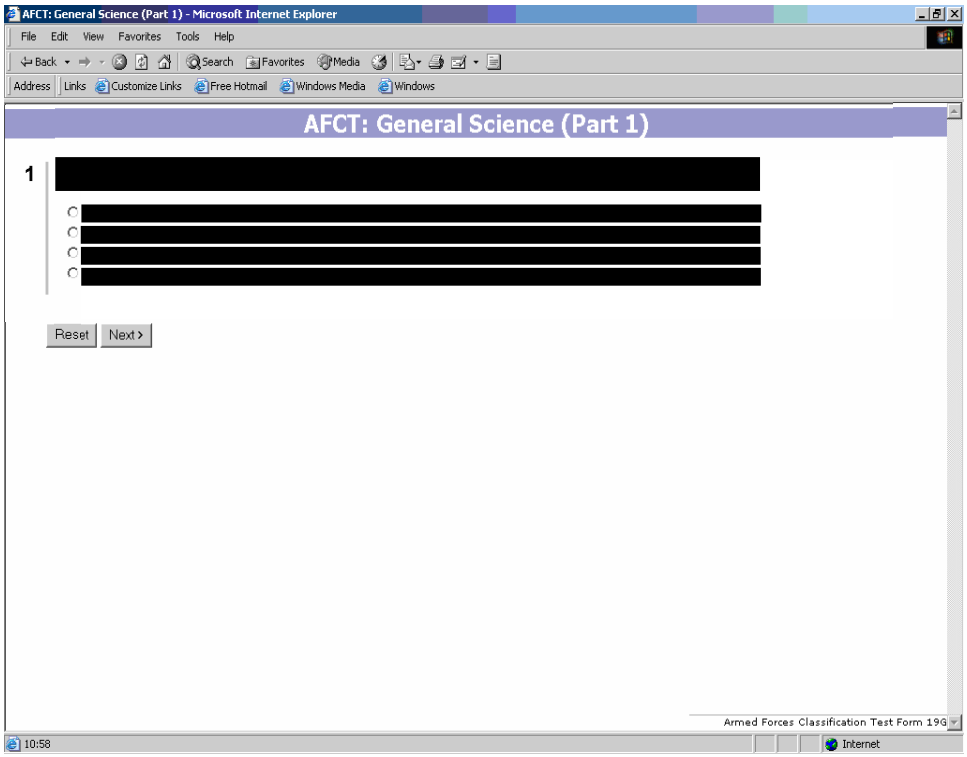



**Figure 1. Web-based AFCT screen layout.**

For the Paragraph Comprehension subtest, each paragraph relates to a few subsequent questions. In the web-based version, the paragraph was presented with the first question; succeeding questions were presented on separate pages but the examinee could go back to the paragraph using the "Previous" button.

Unlike the paper-based version, the web-based AFCT was self-paced. If one subtest took only 10 minutes for a respondent to complete, they could then proceed to the next subtest when they were ready. If the respondent exceeded the total time on a subtest, the subtest would stop and indicate that it was now time to continue to the next subtest.

## Testing Room Layout

Paper-based testing occurred in one of two locations. The first location was a classroom, with each examinee having an individual table/chair combination. To minimize concerns about cheating, each column of chairs was about 2 feet apart from the one next to it.

The second location for paper-based testing was a hangar bay. Large tables were available, with two chairs per table. Respondents were asked to sit in every other chair, to again minimize the potential for cheating.

Because of the electricity requirements for the web-based testing condition, testing only occurred in a classroom environment. The chairs were arranged as seen in Figure 2, with pairs of subjects facing each other. Each chair was 2 feet from other chairs to the left and right, and the laptop screens served as dividers between examinees.

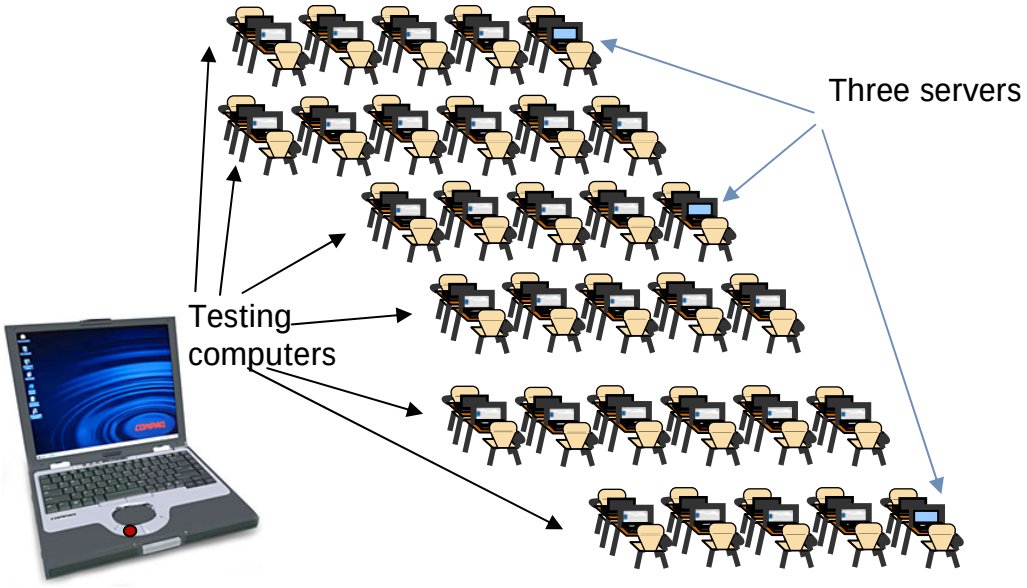



**Figure 2. Room layout for web-based testing.**

Testing computers were Compaq Evo N1020v laptops with Windows XP and IE 6.x loaded. Up to three servers (either Windows NT or 2003) were used at a time, with at most 23 testing laptops connected through CAT-5 cables to each server. The Windows 2003 server took longer to present succeeding pages, but the loading time did not count against the subtest time as there was no question displayed during the loading period.

In both conditions, at least two proctors monitored testing. In the classroom conditions, proctors wandered between each column of desks; in the web-based condition, proctors also wandered between each row of desks and were usually facing opposite directions to best monitor test-taking.

## Subjects

Testing was conducted from 31 July to 13 September 2006. Participants were personnel assigned to NSTC Great Lakes during that time period. The majority were students in "A" School (who were selected by duty section) or in indoctrination sections prior to "A" School (generally after their last indoctrination class ended). A small portion was students not under instruction (NUI) and two were staff members (E-6).

Results from subjects who did not include a complete SSN on testing paperwork or who did not sign the Privacy Act Statement were not included in subsequent analyses. In addition, the two staff members were not included because of the potential that their additional Navy service could have changed their responses.

A few participants took the test multiple times, in the same or different format. Only the first set of answers was used for analyses. In one case, one format was complete and the second only had a few answers; the assumption was that the person realized they were doing it again and stopped, so only the complete set of answers was used. In

another case, both sets of answers were complete and it was unclear which occurred first; all data for that person was excluded. Table 2 contains the overall number of respondents for each of the analysis groups.

**Table 2**
**Overall number of AFCT subjects**

| | Overall | Male | Female | Majority | Minority |
|---|---|---|---|---|---|
| Paper (p) | 689 | 547 | 91 | 412 | 177 |
| Web (w) | 762 | 572 | 111 | 361 | 229 |

Some subjects seemingly chose to not take the test seriously and recorded some pattern (e.g., all As, ABCD repeated, AABBCCDD repeated, etc.) in their answers. Because it is unclear what constitutes a pattern and what is a legitimate answer, and because this behavior likely occurred in both paper-based and web-based modes, all these answers are included.

Some of the subtests were partially blank. This may have occurred because they skipped questions, ran out of time, or had to leave the test early. Data were retained for those who had answered at least half of the questions in the subtest. The number of subjects varies by subtest; Ns are included where appropriate in the results section.

## Procedure

As participants arrived, all were asked to sign in. The sign-in sheets included spaces for names, the last 4 digits of their Social Security Numbers, gender, ethnicity, and rating or school. Once signed in, participants generally were divided by the last digit of their SSN, with even SSNs receiving the paper AFCT and odd SSNs receiving the web-based AFCT. There were a few testing sessions where there was insufficient room for paper-based testing; in those cases, respondents were first escorted into the computer lab until all computers were filled, and then the overflow went to another room to receive the paper-based test. (See Appendix A for details of additional analyses conducted to ascertain if the two groups were similar based upon their pre-existing ASVAB scores.)

To minimize the impact of computer illiteracy on the web-based testing, examinees in the web-based condition were allowed to play games before the testing started using the koala-pad mouse on the laptop. A colored dot was affixed to each computer to indicate which button was the left mouse button to be used to select answers.

General AFCT Form 19G instructions were adapted for the experiment. Appendix B includes the modifications to the general instructions, with annotations provided to indicate where the additions occurred and for whom.

In both conditions, respondents were read instructions about the voluntary nature of the testing. In the course of the instructions, they were then asked to read and sign the Privacy Act statement (Appendix C). Normally, any AFCT score is recorded in personnel

files. Due to the uniqueness of the testing situation, examinees were informed that their scores would only be changed if they were higher than previous scores as indicated in the Privacy Act.

All examinees, regardless of condition, were given 2 pencils and 2 pieces of scratch paper, as indicated in normal AFCT instructions. Examinees could ask for additional pencils or paper at any time during the testing by raising their hand.

In the paper-based condition, the test administrators read instructions at the beginning of each subtest, including the sample problem(s), the number of questions in that subtest, and the time limit. Once all questions had been answered, the test administrators would start the subtest and then post the start and end time on a board at the front of the room. Those in the web-based condition were not read that information because of the asynchronous nature of the testing, but that information was available for them to read prior to starting the subtest.

## Data Analyses

Tests were scored using the item response theory methodology laid out by Segall (2005), specifically the three parameter logistic model. Responses were recoded to be 1 if correct and 0 if incorrect or blank. Theta scores were computed from the given parameters using the bisection algorithm and then theta scores were translated to standard scores based on the 1997 ASVAB normative scale. Appendix D contains the SAS programming[2] used for scoring and converting the scores to standard scale scores.

Once scale scores were computed for all subjects, an equating study was conducted. Because of the relatively small number of cases, linear equating was chosen (Stoloff, 1986). In linear equating, lines are computed using the means ($\mu$) and standard deviations ($\sigma$) of both tests as follows, where p = paper and w = web (Kolen & Brennan, 1995):

$$p = (\sigma_p/\sigma_w)*w + (\mu_p-((\sigma_p/\sigma_w)*\mu_w))$$
$$w = (\sigma_w/\sigma_p)*p + (\mu_w-((\sigma_w/\sigma_p)*\mu_p))$$

Using these formulae, scores were calculated for all possible scores between 20 and 80, and the two lines were graphed. Lines that are close together, especially at the scale mean of 50, indicate that the scores for the two tests are similar.

While standard scores should range from 20 to 80 and are graphed as such, scores for each subtest vary. Table 3 shows the actual range of standard scores by subtest; for the linear equating graphs that follow, all subtest scores are graphed assuming a range of 20 to 80. Since Form 19G was not constructed using Item Response Theory and it was not based on the 1997 normative population, the test score ranges are inconsistent. In particular, there are insufficient numbers of difficult items (all but one subtest has a maximum score below 80) and in several cases there are items that are so easy that (when missed) produce a minimum score lower than 20.

[2] The author would like to thank Dr. David Alderton for his SAS programming (Appendix D) to create scale scores.

**Table 3**
**Standard Score Ranges**

| | Subject | With all wrong answers selected | With all correct answers selected |
|---|---|---|---|
| 1 | General Science (GS) | 19 | 72 |
| 2 | Arithmetic Reasoning (AR) | 24 | 68 |
| 3 | Word Knowledge (WK) | 15 | 66 |
| 4 | Paragraph Comprehension (PC) | 25 | 62 |
| 5 | Mathematics Knowledge (MK) | 27 | 67 |
| 6 | Electronics Information (EI) | 23 | 80 |
| 7 | Automotive and Shop (AS) | 23 | 76 |
| 8 | Mechanical Comprehension (MC) | 28 | 75 |
| 9 | Assembling Objects (AO) | 27 | 66 |
| | Verbal (VE) (Composite of PC and WK) | 16 | 66 |

# Results

Results are presented for the overall group, male and female, and majority and minority ethnicity. The results briefing is available in Appendix E, and detailed subtest information by question is available in Appendix F.[3]

## General Science

Figure 3 shows the results for all examinees on the General Science (GS) subtest. To determine the equivalent paper-based score from the score obtained when taking the web version, the red diagonal line (p = 1.06w-2.41) would be used since the paper score is the unknown. The red arrows show that a score of 75 on the web would be equivalent to a score of 77 on paper; paper-based scores are slightly higher than web-based scores at the higher end of the score range, although not significantly so.

[3] After completion of all analyses, respondent scores were changed if they did better on all 9 subtests. Scores were changed for only 5 participants.

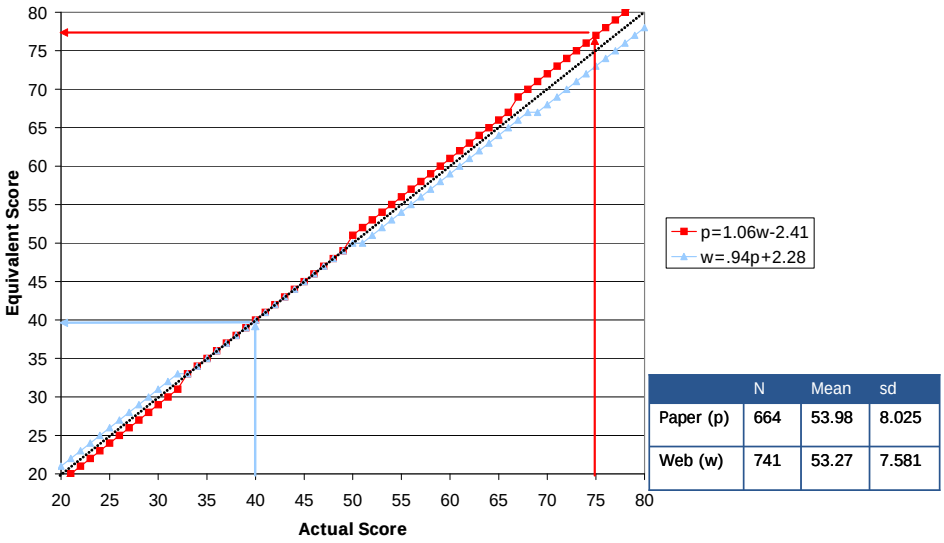
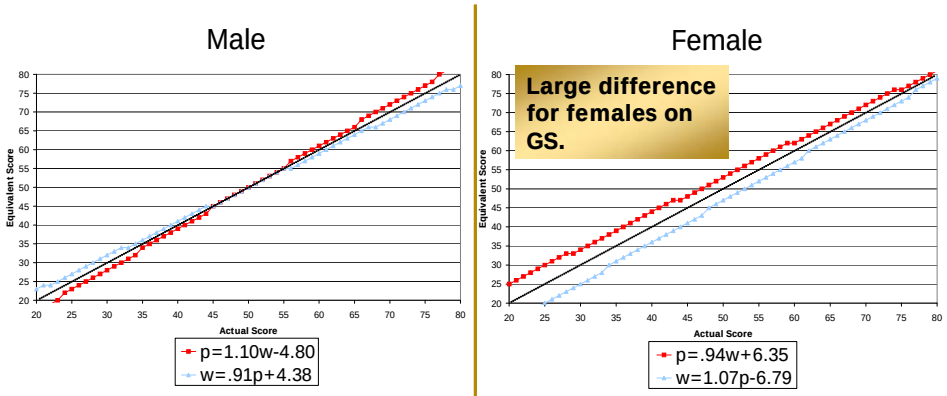



**Figure 3. Linear equating for General Science.**

To convert from a paper score to an equivalent web score, the blue diagonal line would be used. As indicated by the blue arrows, a paper score of 40 would be equivalent to a web score of 40. The dotted black line is the identity line, where the two versions would be considered equivalent; because the red line and blue line overlap with the identity line from 33 to 50, scores in that range are equivalent between the two versions of the subtest. Scores below 33 tended to be higher for the web-based subtest and scores over 50 higher for the paper-based subtest.

Figures 4 and 5 show the results for GS by gender and ethnicity. Scores for males are equivalent between the two subtests around the mean of 50 (from scores of 45 to scores of 55), but vary by 3 points at the extremes in the same direction as seen for all examinees above. Women tend to score significantly higher on the paper version of the subtest than the web version, especially when the score is low. However, the results for females are inherently unstable because of the small sample sizes, particularly for equating purposes.

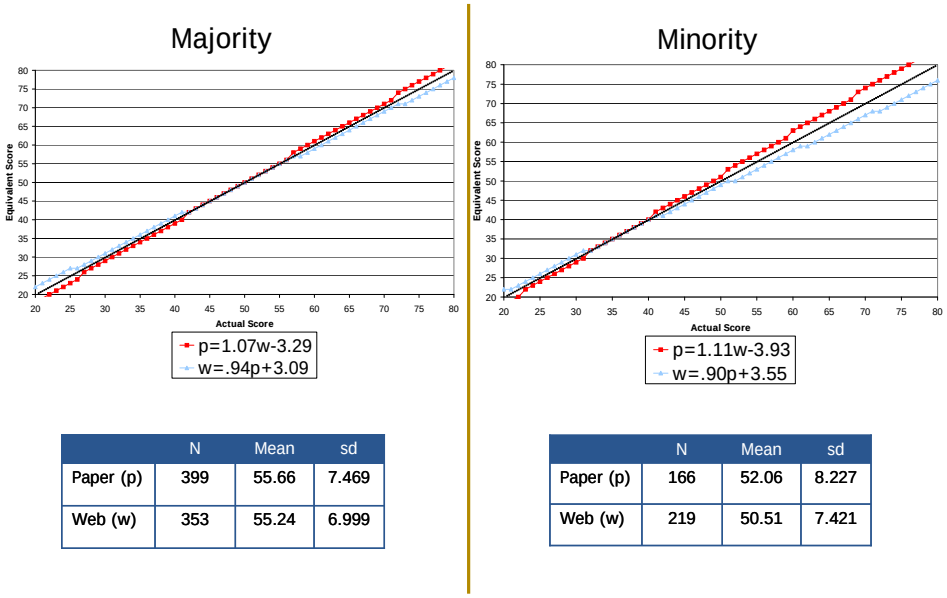



| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 525 | 54.62 | 8.010 |
| Web (w) | 552 | 54.22 | 7.309 |

| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 90 | 53.03 | 7.257 |
| Web (w) * | 111 | 49.92 | 7.760 |

* Significant difference between paper and web for females ($t$=2.908, $p$=.00).

**Figure 4. Linear equating for General Science by gender.**




| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 399 | 55.66 | 7.469 |
| Web (w) | 353 | 55.24 | 6.999 |

| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 166 | 52.06 | 8.227 |
| Web (w) | 219 | 50.51 | 7.421 |

**Figure 5. Linear equating for General Science by ethnicity.**

The results for the majority ethnicity are similar to those found for the males, with scores being equivalent around the mean (between 42 and 56 inclusive), higher for paper for scores above the mean, and higher for web for scores below the mean. Scores for minority again are equivalent, but in a range below the mean (32 to 40). As with majority, paper-based scores tend to be higher than web-based scores for the high end of the score range, but the difference is slightly larger.

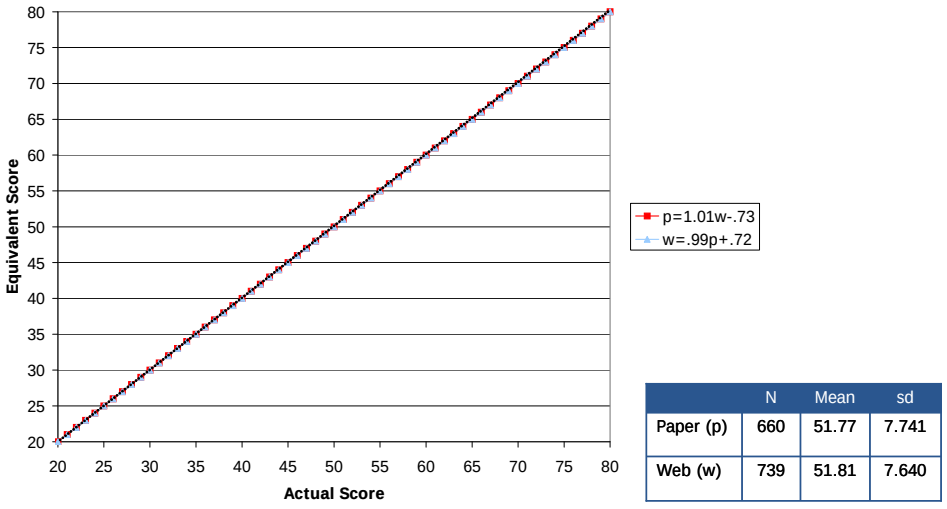
One-way Analyses of Variance (ANOVAs) were computed for the scale scores. Table 4 shows that the only significant difference in mean GS scores was for females.

**Table 4**
**One-way ANOVAs for General Science scale scores**

| Between Groups | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Overall | 177.306 | 1 | 177.306 | 2.919 | .088 |
| Males | 43.803 | 1 | 43.803 | .747 | .388 |
| Females | 482.083 | 1 | 482.083 | 8.481 | .004 |
| Majority | 32.338 | 1 | 32.338 | .615 | .433 |
| Minority | 227.852 | 1 | 227.852 | 3.766 | .053 |

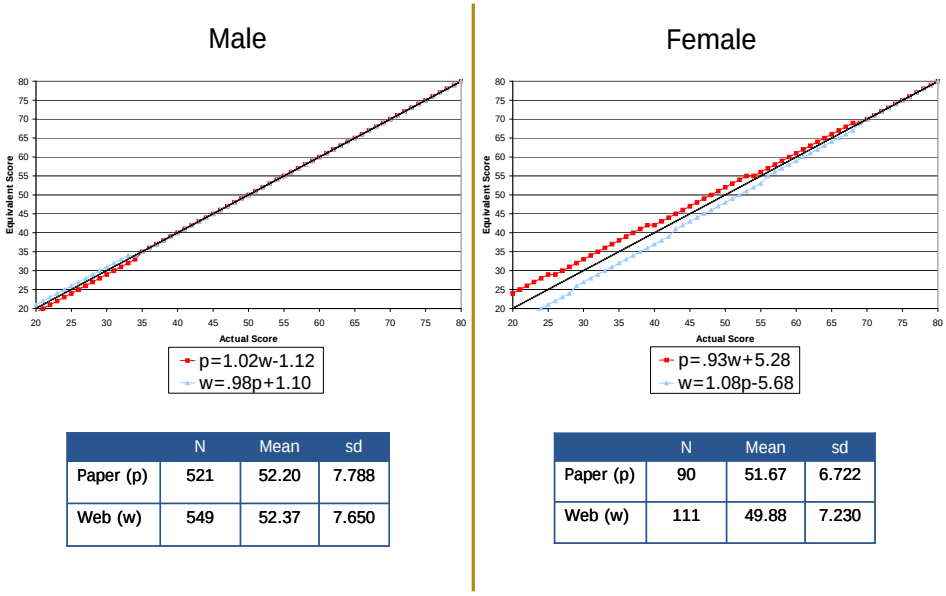
## Arithmetic Reasoning

Results for the Arithmetic Reasoning (AR) subtest for all respondents found the two versions of the subtest to be equivalent (Figure 6). Results for males show that the two subtests are generally equivalent, with a one point difference for scores below 35 (Figure 7), while the results for females as well as for both the majority and minority group (Figure 8) show more differentiation, especially for the female and minority groups. For females, paper-based scores tend to be at most four points higher (although equivalent for scores 69 and above). Results for majority are equivalent from 50–70 and at most 2 points different for low scores while the results for minority show that web-based scores are higher by 5 points at the lower end of the scale and paper-based scores are higher by 2 points at the higher end of the scale (equivalent between 56 and 65).




| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 660 | 51.77 | 7.741 |
| Web (w) | 739 | 51.81 | 7.640 |

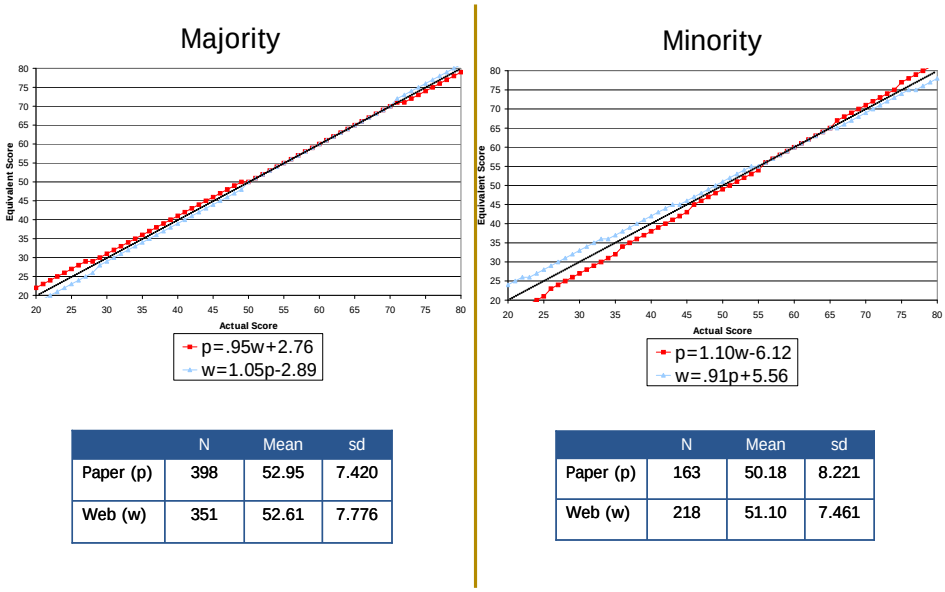
**Figure 6. Linear equating for Arithmetic Reasoning.**




| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 521 | 52.20 | 7.788 |
| Web (w) | 549 | 52.37 | 7.650 |

| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 90 | 51.67 | 6.722 |
| Web (w) | 111 | 49.88 | 7.230 |

**Figure 7. Linear equating for Arithmetic Reasoning by gender.**




| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 398 | 52.95 | 7.420 |
| Web (w) | 351 | 52.61 | 7.776 |

| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 163 | 50.18 | 8.221 |
| Web (w) | 218 | 51.10 | 7.461 |

**Figure 8. Linear equating for Arithmetic Reasoning by ethnicity group.**

Table 5 shows the results of one-way ANOVAs; no significance was found for any group.

**Table 5**
**One-way ANOVAs for Arithmetic Reasoning scale scores**

| Between Groups | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Overall | .672 | 1 | .672 | .011 | .915 |
| Males | 8.262 | 1 | 8.262 | .139 | .710 |
| Females | 158.144 | 1 | 158.144 | 3.221 | .074 |
| Majority | 22.254 | 1 | 22.254 | .386 | .534 |
| Minority | 78.668 | 1 | 78.668 | 1.295 | .256 |

## Word Knowledge

The linear equating for Word Knowledge (WK) showed minimal variance. For all examinees, the two subtests were equivalent for scores from 40 to 54. For higher scores, the paper version of the text tended to be higher while the web version was higher when scores were below 40 (see Figure 9).

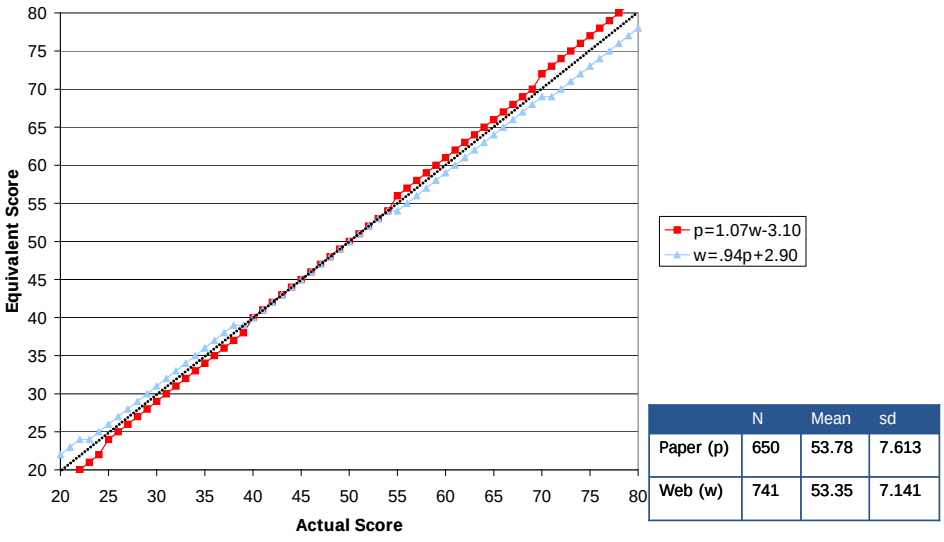
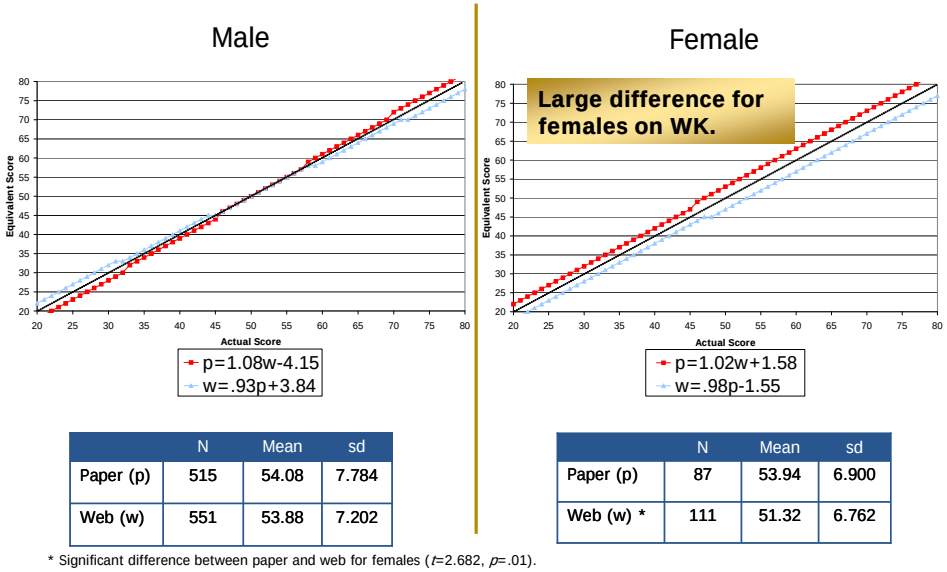



**Figure 9. Linear equating for Word Knowledge.**

Linear equating by subgroup again shows minimal variance for males but a larger difference for females (See Figure 10). While the lines for males cross and the scores are equivalent from 46 to 57, the scores for females are always higher in the paper version.



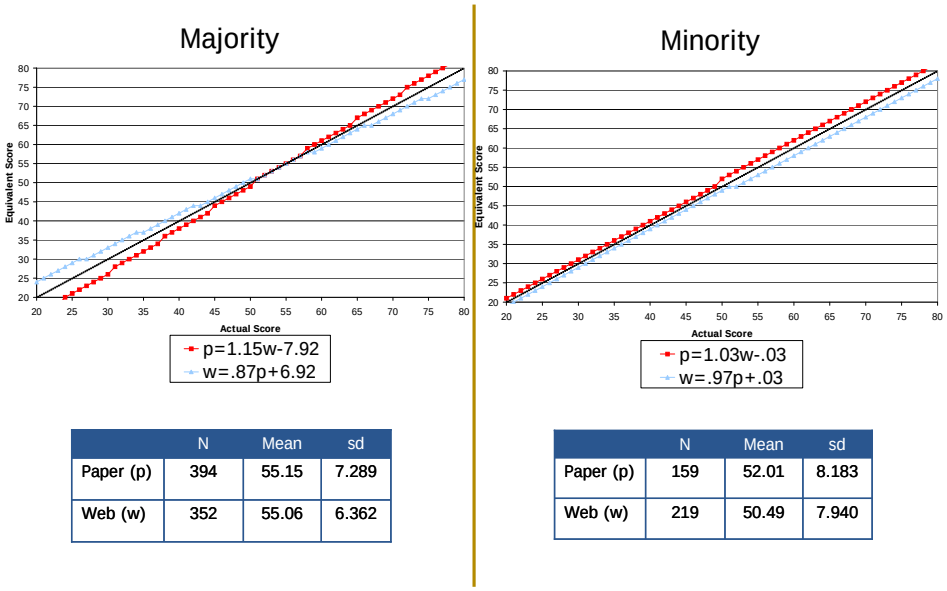

| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 515 | 54.08 | 7.784 |
| Web (w) | 551 | 53.88 | 7.202 |

| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 87 | 53.94 | 6.900 |
| Web (w) * | 111 | 51.32 | 6.762 |

* Significant difference between paper and web for females ($t$=2.682, $p$=.01).

**Figure 10. Linear equating for Word Knowledge by gender.**

As with males, the majority subgroup shows that the lines again cross with the subtests being equivalent in the middle range of scores (51 to 57, see Figure 11). The scores for the minority show a small difference, with paper-based scores always being higher than web-based scores.




| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 394 | 55.15 | 7.289 |
| Web (w) | 352 | 55.06 | 6.362 |

| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 159 | 52.01 | 8.183 |
| Web (w) | 219 | 50.49 | 7.940 |

**Figure 11. Linear equating for Word Knowledge by ethnicity group.**

One-way ANOVAs were computed for all groups. Findings are significant for the female sub-group, as indicated in Table 6.

## Table 6
## One-way ANOVAs for Word Knowledge scale scores

| Between Groups | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Overall | 65.548 | 1 | 65.548 | 1.208 | .272 |
| Males | 11.197 | 1 | 11.197 | .200 | .655 |
| Females | 336.642 | 1 | 336.642 | 7.231 | .008 |
| Majority | 1.694 | 1 | 1.694 | .036 | .850 |
| Minority | 212.190 | 1 | 212.190 | 3.280 | .071 |

## Paragraph Comprehension

Paragraph comprehension (PC) scores tend to be higher for the paper version than the web, although they are equivalent for scores of 72 and above (see Figure 12). Comparisons by subgroup show this same basic trend, with lines for the female subgroup showing the largest point difference (see Figures 13 and 14).

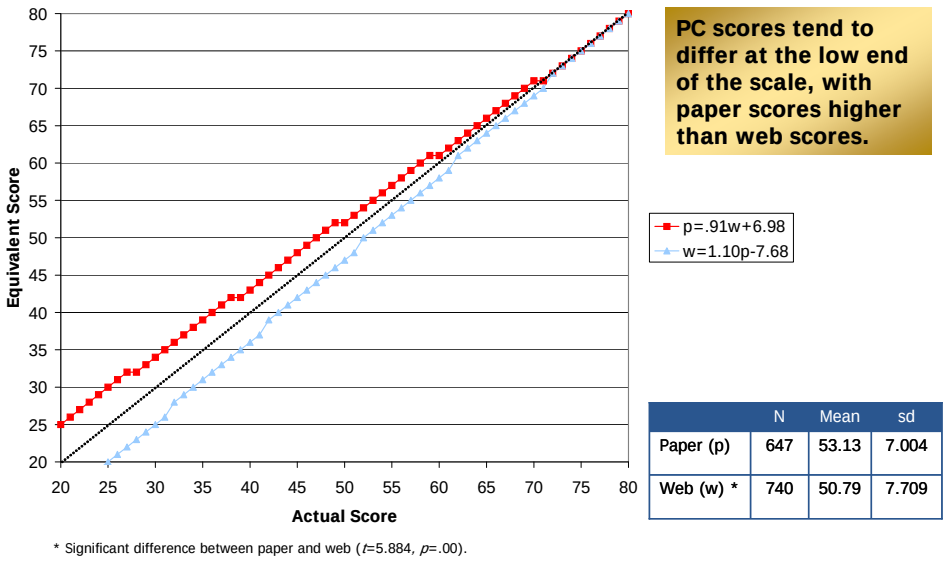
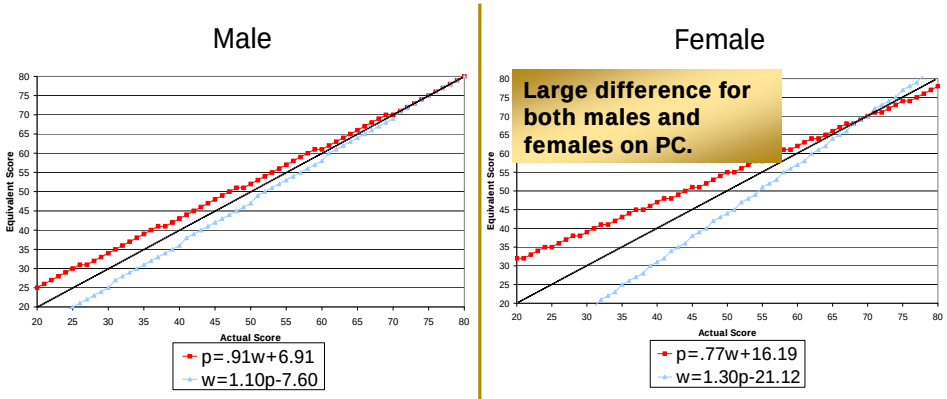



**Figure 12. Linear equating for Paragraph Comprehension.**

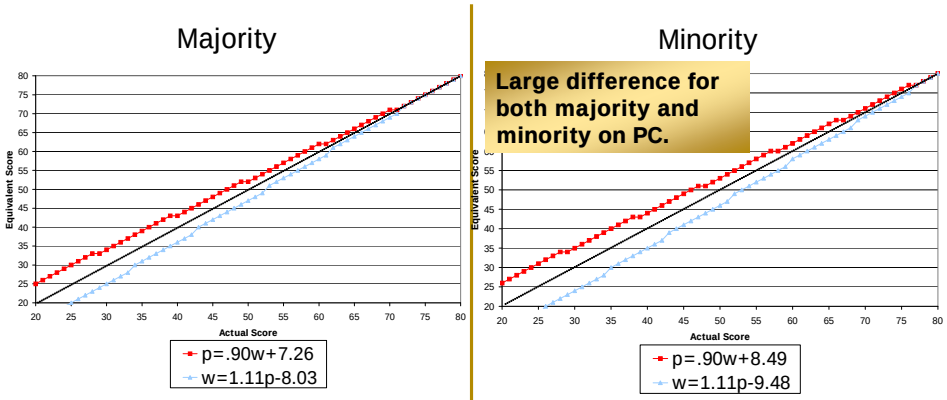



| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 511 | 53.30 | 7.027 |
| Web (w) * | 551 | 51.07 | 7.736 |

| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 88 | 54.53 | 5.628 |
| Web (w) * | 110 | 50.03 | 7.343 |

* Significant difference between paper and web for males ($t$=4.905, $p$=.00) and females ($t$=4.741, $p$=.00).

**Figure 13. Linear equating for Paragraph Comprehension by gender.**




| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 391 | 54.04 | 6.817 |
| Web (w) * | 352 | 51.74 | 7.539 |

| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 158 | 52.39 | 7.127 |
| Web (w) * | 218 | 49.04 | 7.960 |

* Significant difference between paper and web for majority ($t$=4.367, $p$=.00) and minority ($t$=4.207, $p$=.00).

**Figure 14. Linear equating for Paragraph Comprehension by ethnicity group.**

Results for the one-way ANOVAs for the Paragraph Comprehension subtest are significant for all groups (see Table 7).

## Table 7
## One-way ANOVAs for Paragraph Comprehension scale scores

| Between Groups | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Overall | 1886.799 | 1 | 1886.799 | 34.561 | .000 |
| Males | 1316.648 | 1 | 1316.648 | 24.021 | .000 |
| Females | 993.002 | 1 | 993.002 | 22.545 | .000 |
| Majority | 979.919 | 1 | 979.919 | 19.073 | .000 |
| Minority | 1028.741 | 1 | 1028.741 | 17.711 | .000 |

### Verbal Composite

The Verbal Composite (VE) is based on the scale scores of combined WK and PC scores. While there were large differences between lines for PC, the differences are somewhat tempered by the similarity of WK, so that the VE scores are very similar between the two administration modes. As seen in Figure 15, the lower range of scores (33 and below) are equivalent between the two subtests before the lines diverge and the scores on the paper version are slightly higher than on the web.

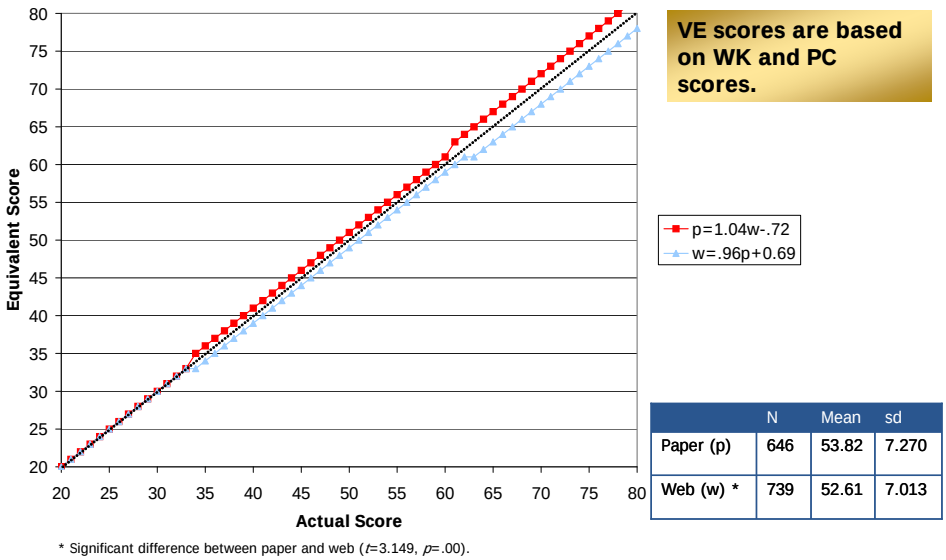
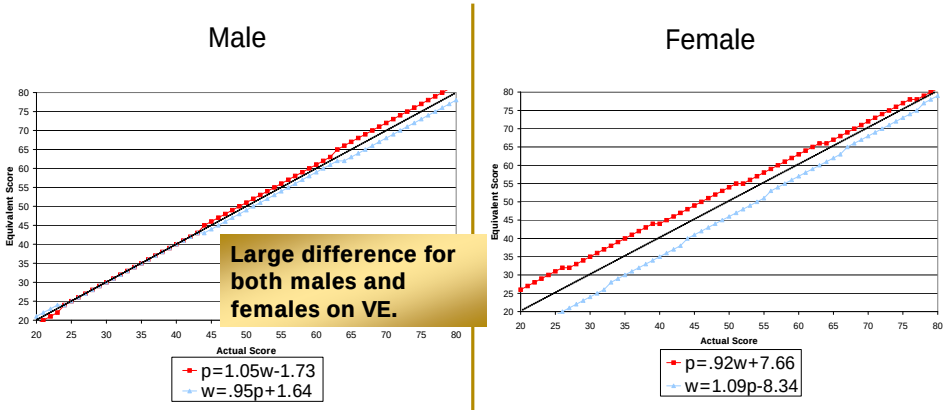



**Figure 15. Linear equating for Verbal composite.**

Lines for the male subgroup are similar to the overall findings, with equivalence at the lower end of the scale (between 24 and 43, inclusive) and the paper being higher than the web on the higher end of the scale (Figure 16). The scores for females are never equivalent, as seen in Figure 16; paper-based scores are always higher, and with a 6 point difference at the low end of the range of scores.



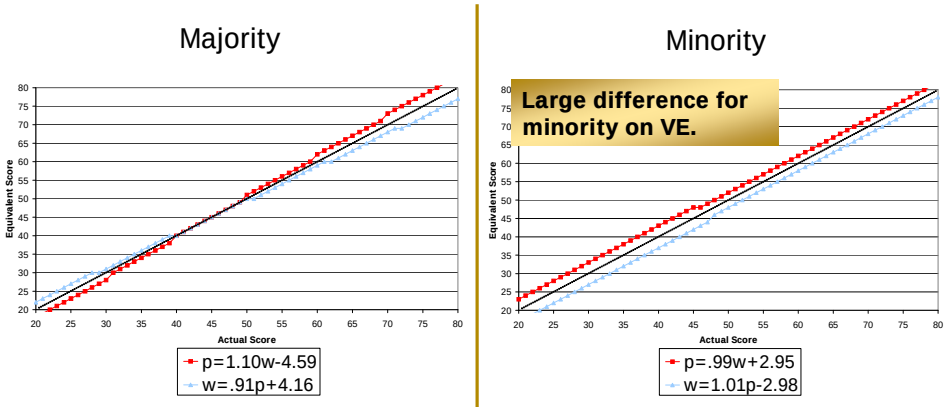

| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 511 | 54.08 | 7.399 |
| Web (w) * | 550 | 53.06 | 7.035 |

| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 87 | 54.52 | 6.344 |
| Web (w) * | 110 | 50.97 | 6.902 |

* Significant difference between paper and web for males ($t$=2.302, $p$=.02) and females ($t$=3.714, $p$=.00).

**Figure 16. Linear equating for Verbal composite by gender.**

The findings for the majority subgroup show equivalence around the mean (40–49). Lower than this, scores for web are slightly higher while the scores at the higher end of the range are higher for paper (see Figure 17). The findings for the minority subgroup are closer to those seen for females; paper-based scores are always higher, by as much as four points.




| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 391 | 55.07 | 7.039 |
| Web (w) | 352 | 54.13 | 6.386 |

| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 158 | 52.39 | 7.605 |
| Web (w) * | 218 | 49.93 | 7.682 |

* Significant difference between paper and web for minority ($t$=3.078, $p$=.00).

**Figure 17. Linear equating for Verbal Composite by ethnicity group.**

One-way ANOVAs show significance for all subgroups except Majority (Table 8).

## Table 8
## One-way ANOVAs for Verbal Composite scale scores

| Between Groups | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Overall | 503.655 | 1 | 503.655 | 9.896 | .002 |
| Males | 274.813 | 1 | 274.813 | 5.283 | .022 |
| Females | 610.322 | 1 | 610.322 | 13.751 | .000 |
| Majority | 166.885 | 1 | 166.885 | 3.677 | .056 |
| Minority | 552.061 | 1 | 552.061 | 9.433 | .002 |

### Mathematics Knowledge

Linear equating of the Mathematics Knowledge (MK) scores shows that the two versions of the subtest are similar. The two are equivalent when the scores range from 35 to 51; web-based scores are higher below that range and paper-based scores are higher above that range (Figure 18). Results for males (Figure 19) and majority (Figure 20) show the same pattern, with scores of males being equivalent from 37 to 52 and scores for majority being equivalent from 26 to 47. Scores for females (Figure 19) also show the same pattern (equivalent from 31–40, inclusive), although the difference in scores between the two versions is larger than for males or overall. The minority subgroup (Figure 20) also shows the same general pattern, although the range of equivalency (44 to 52) is smaller than the overall results and the differences between scores at the extremes are larger.

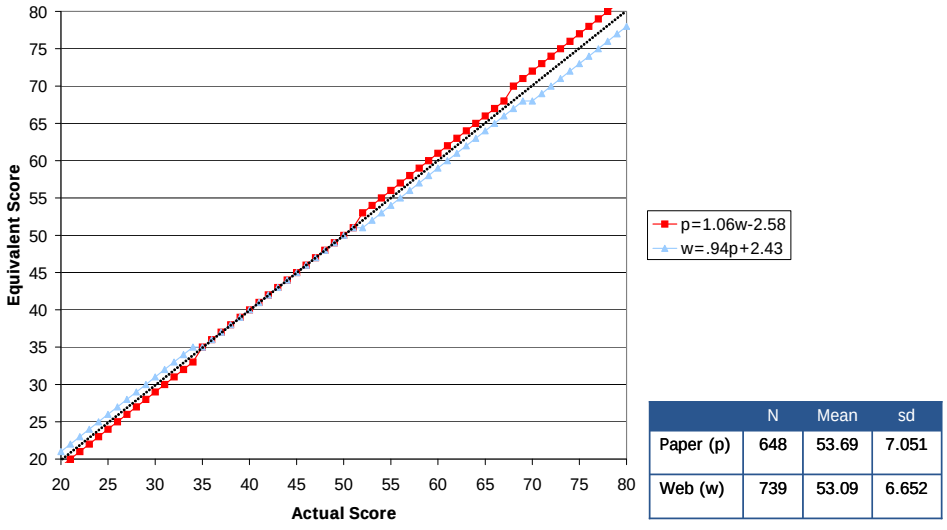
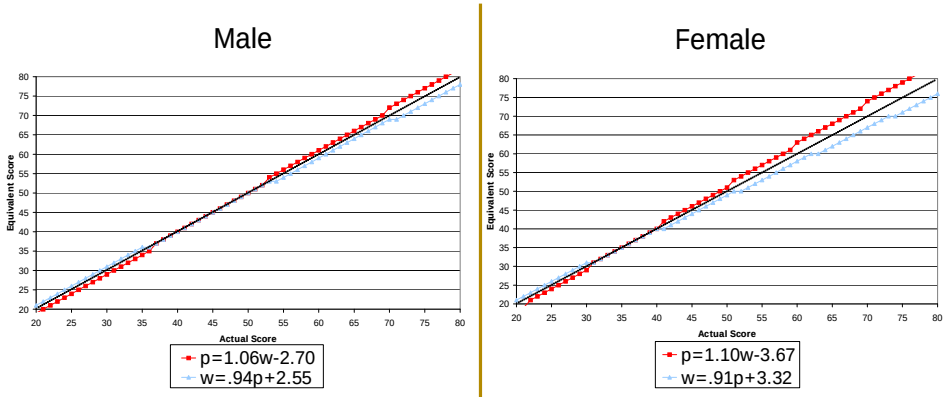


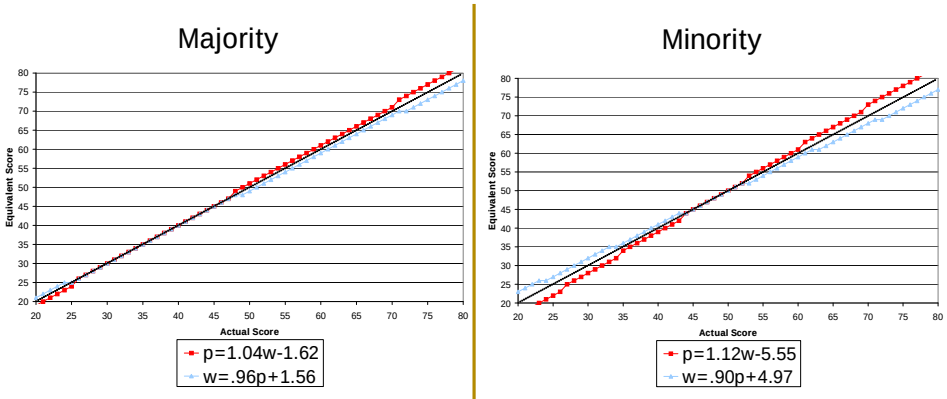

**Figure 18. Linear equating for Mathematics Knowledge.**




| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 512 | 54.05 | 7.101 |
| Web (w) | 549 | 53.50 | 6.695 |

| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 88 | 53.61 | 6.510 |
| Web (w) | 111 | 51.94 | 5.903 |

**Figure 19. Linear equating for Mathematics Knowledge by gender.**




| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 392 | 54.60 | 7.003 |
| Web (w) | 350 | 53.83 | 6.705 |

| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 158 | 52.50 | 7.173 |
| Web (w) | 219 | 52.02 | 6.427 |

**Figure 20. Linear equating for Mathematics Knowledge by ethnicity group.**

One-way ANOVAs show no significant differences for the groups (Table 9).

**Table 9**
**One-way ANOVAs for Mathematics Knowledge scale scores**

| Between Groups | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Overall | 128.131 | 1 | 128.131 | 2.737 | .098 |
| Males | 79.007 | 1 | 79.007 | 1.662 | .198 |
| Females | 137.995 | 1 | 137.995 | 3.615 | .059 |
| Majority | 108.269 | 1 | 108.269 | 2.298 | .130 |
| Minority | 21.300 | 1 | 21.300 | .468 | .495 |

## Electronics Information

The scores for the Electronics Information (EI) subtest show similarity between the two groups; almost consistently through the range of scores there is a one point difference between the paper-based and web-based scores (Figure 21). Males (Figure 22) and the majority subgroup (Figure 23) show this same tendency, with males scoring exactly the same on the two versions except at the maximum (77 and above) and majority being exactly the same above a score of 47 and one point different below that.

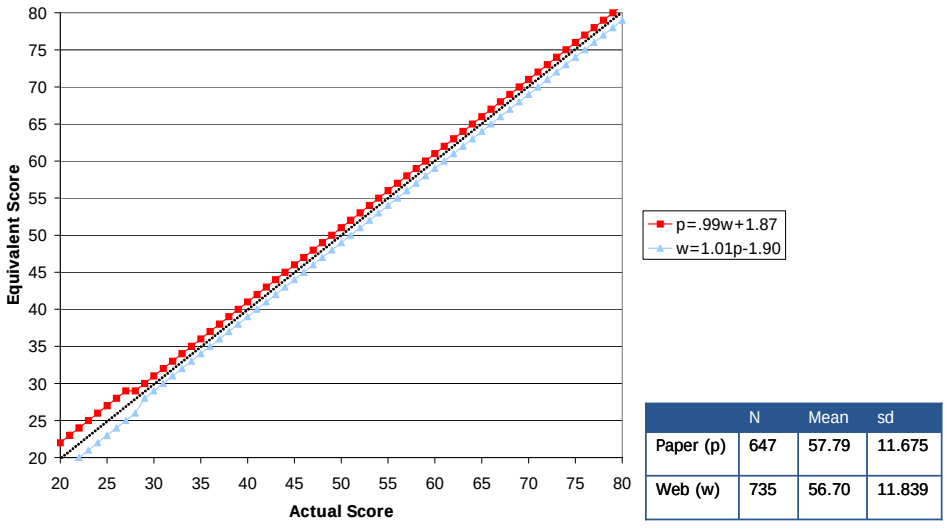
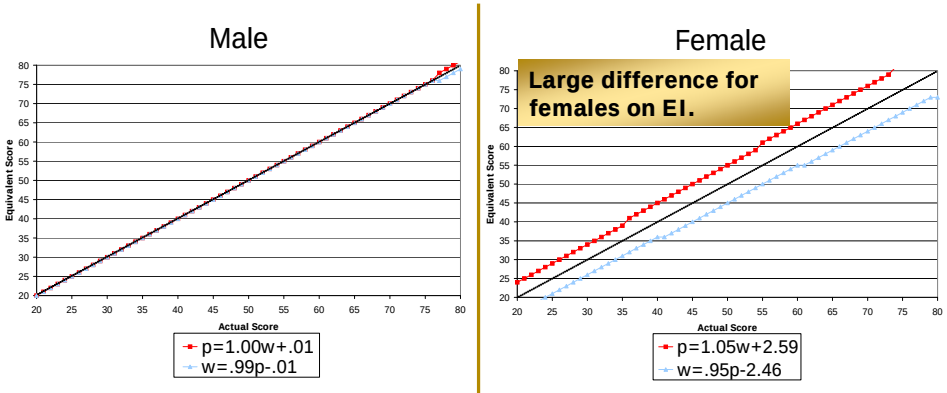



**Figure 21. Linear equating for Electronics Information.**

Noticeable differences were found for the scores of females (Figure 22) and minority (Figure 23). Scores on the web-based version are 5–7 points lower for females than on the paper-based version; the difference ranges from 3–4 points for minority.

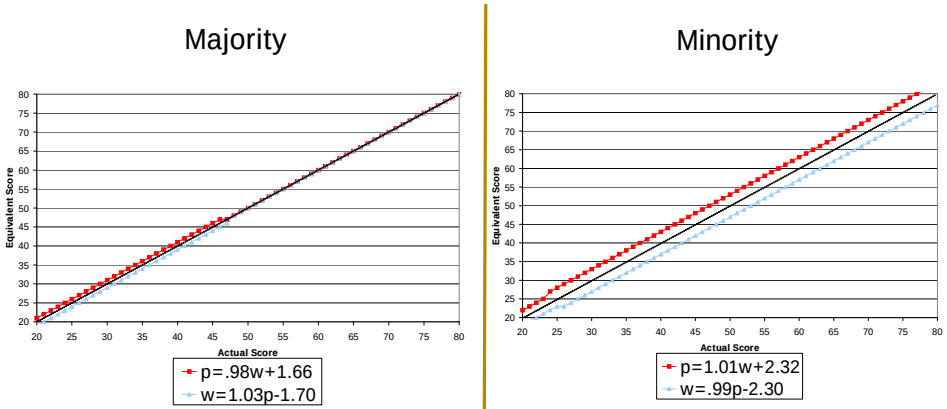



| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 511 | 59.22 | 11.709 |
| Web (w) | 545 | 58.83 | 11.634 |

| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 88 | 52.90 | 9.047 |
| Web (w) * | 111 | 47.77 | 8.590 |

* Significant difference between paper and web for females ($t$=4.087, $p$=.00).

**Figure 22. Linear equating for Electronics Information by gender.**




| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 391 | 59.71 | 11.311 |
| Web (w) | 347 | 59.53 | 11.600 |

| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 158 | 55.33 | 11.601 |
| Web (w) * | 218 | 52.61 | 11.513 |

* Significant difference between paper and web for minority ($t$=2.254, $p$=.03).

**Figure 23. Linear equating for Electronics Information by ethnicity group.**

One-way ANOVAs show a significant difference between paper and web for only the females (Table 10).

## Table 10
## One-way ANOVAs for Electronics Information scale scores

| Between Groups | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Overall | 408.580 | 1 | 408.580 | 2.953 | .086 |
| Males | 39.724 | 1 | 39.724 | .292 | .589 |
| Females | 1292.764 | 1 | 1292.764 | 16.715 | .000 |
| Majority | 5.837 | 1 | 5.837 | .045 | .833 |
| Minority | 679.541 | 1 | 679.541 | 5.094 | .025 |

### Automotive and Shop

Linear equating for Automotive and Shop (AS) scores shows that paper versions of the subtest tend to score 1 or 2 points higher for those who score 61 or below (Figure 24). For those scores at the high end of the range, the two subtests are equivalent. This general pattern holds true for males (Figure 25), although the subtest is even more equivalent (from scores 29 and up).

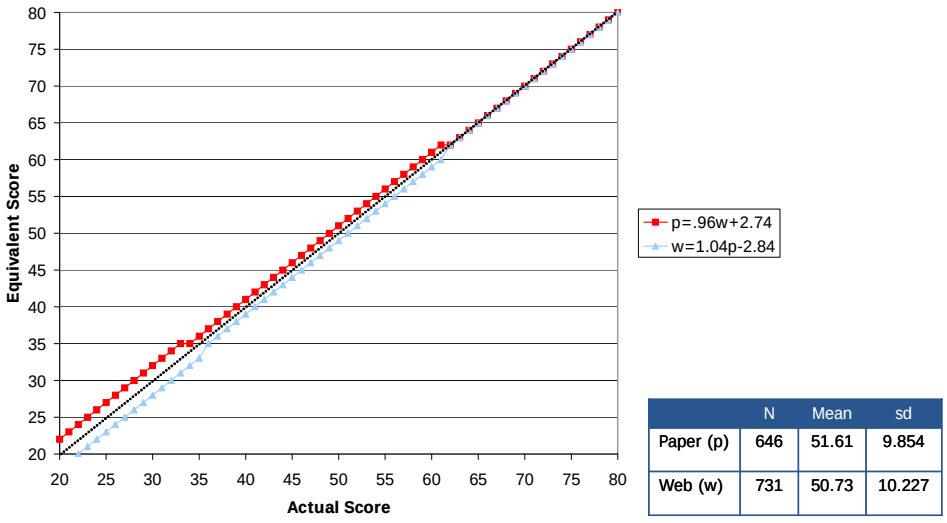
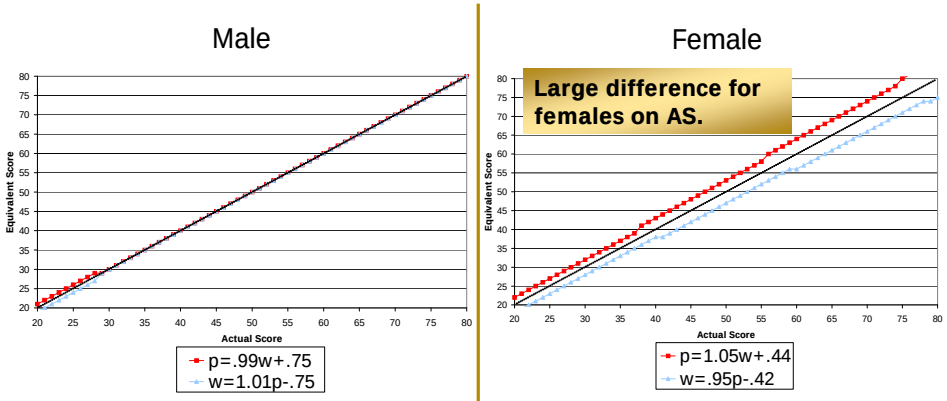



**Figure 24. Linear equating for Automotive and Shop.**




| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 510 | 53.01 | 9.803 |
| Web (w) | 543 | 52.73 | 9.890 |

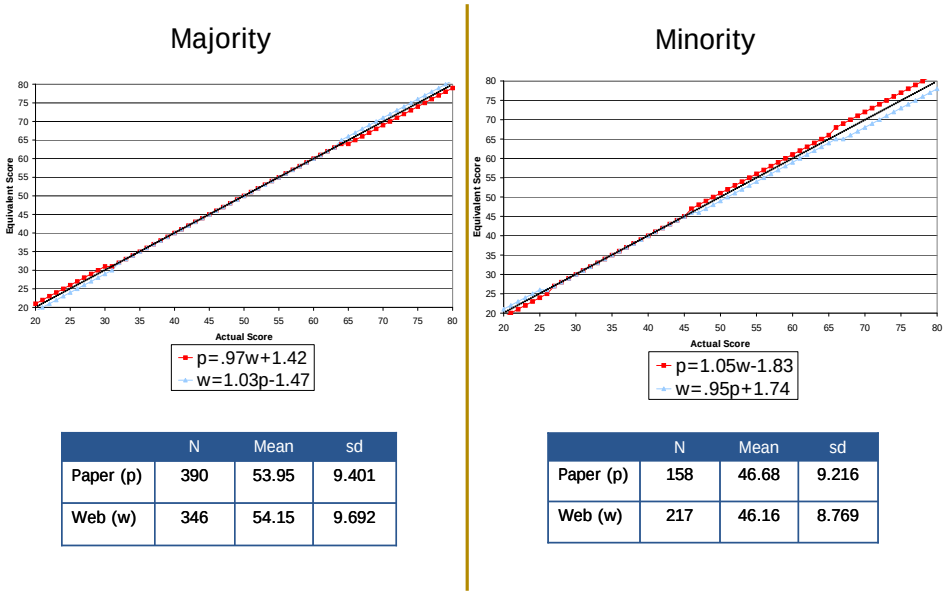
| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 88 | 44.94 | 6.464 |
| Web (w) * | 110 | 42.19 | 6.128 |

* Significant difference between paper and web for females ($t$=3.062, $p$=.00).

**Figure 25. Linear equating for Automotive and Shop by gender.**

Scores for females show divergence between paper-based and web-based, with paper-based scores tending to be four points higher or more (Figure 25). The difference between the subtests increases as the scores increase.

Graphs for both majority and minority show areas of equivalence (Figure 26). The subtests are generally equivalent for the majority subgroup, with a 1 point difference (paper higher) for those below 32 and a 1 point difference (web higher) for scores above 63. The reverse trend is true for minority; web-based scores are higher below 27 and paper-based scores are higher above 45.




| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 390 | 53.95 | 9.401 |
| Web (w) | 346 | 54.15 | 9.692 |

| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 158 | 46.68 | 9.216 |
| Web (w) | 217 | 46.16 | 8.769 |

**Figure 26. Linear equating for Automotive and Shop by ethnicity group.**

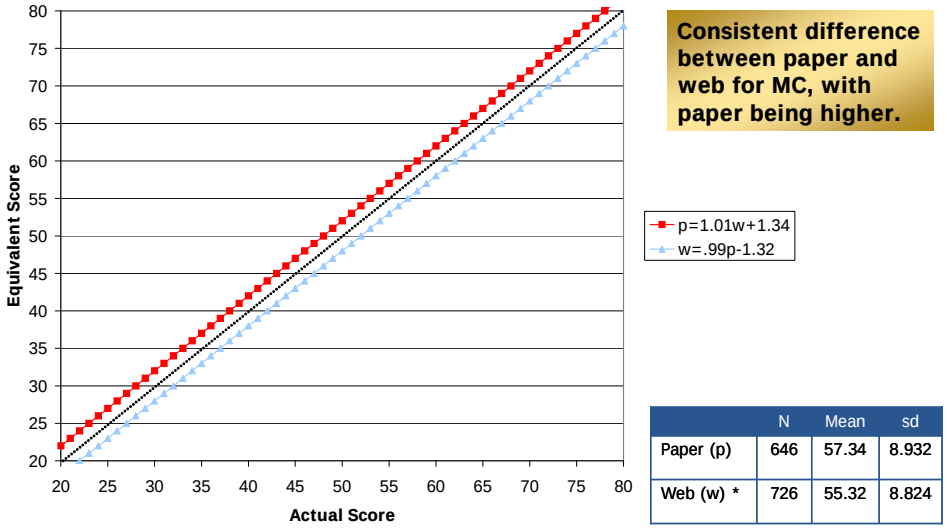
One-way ANOVAs show the similarity between the two versions of the subtest for all groups except females, where the subtest mode causes significant differences in the scores (Table 11).

**Table 11**
**One-way ANOVAs for Automotive and Shop scale scores**

| Between Groups | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Overall | 270.513 | 1 | 270.513 | 2.676 | .102 |
| Males | 20.950 | 1 | 20.950 | .216 | .642 |
| Females | 370.334 | 1 | 370.334 | 9.393 | .002 |
| Majority | 7.473 | 1 | 7.473 | .082 | .774 |
| Minority | 24.773 | 1 | 24.773 | .309 | .579 |

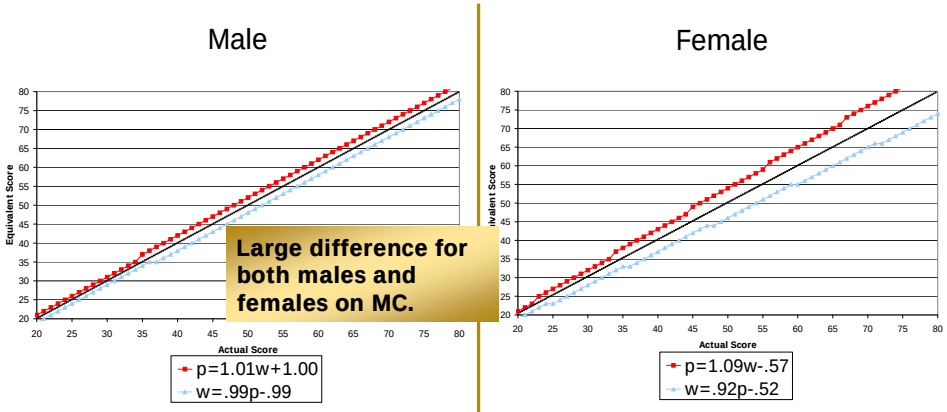
## Mechanical Comprehension

Scores for the Mechanical Comprehension (MC) are consistently different; with paper-based scores being two points higher than web-based scores (see Figure 27). This trend is generally consistent for each of the subgroups at the higher end of the score range (see Figures 28 and 29). For lower scores, differences between the two subtests are smaller (equivalent for majority for scores 33 and lower).




* Significant difference between paper and web ($t$=4.208, $p$=.00).

**Figure 27. Linear equating for Mechanical Comprehension.**

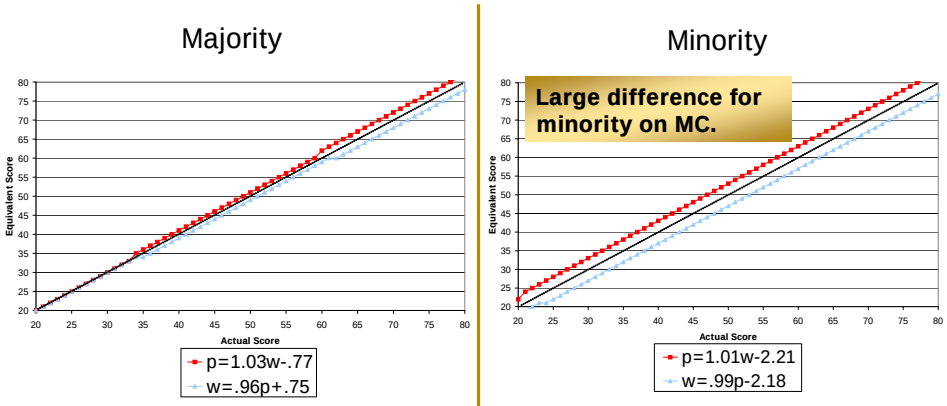



| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 510 | 58.28 | 8.912 |
| Web (w) * | 539 | 56.47 | 8.786 |

| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 88 | 53.98 | 7.680 |
| Web (w) * | 109 | 49.95 | 7.033 |

* Significant difference between paper and web for males ($t$=3.312, $p$=.00) and females ($t$=3.837, $p$=.00).

**Figure 28. Linear equating for Mechanical Comprehension by gender.**




| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 390 | 58.92 | 8.725 |
| Web (w) | 345 | 57.51 | 8.405 |

| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 158 | 54.66 | 8.688 |
| Web (w) * | 215 | 51.73 | 8.569 |

* Significant difference between paper and web for minority ($t$=3.244, $p$=.00).

**Figure 29. Linear equating for Mechanical Comprehension by ethnicity group.**

As shown in Table 12, results of one-way ANOVAs indicate significant differences between the two subtests' means for all groups except majority.

## Table 12
## One-way ANOVAs for Mechanical Comprehension scale scores

| Between Groups | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Overall | 1385.993 | 1 | 1385.993 | 17.597 | .000 |
| Males | 859.454 | 1 | 859.454 | 10.979 | .001 |
| Females | 788.087 | 1 | 788.087 | 14.671 | .000 |
| Majority | 365.632 | 1 | 365.632 | 4.971 | .026 |
| Minority | 781.673 | 1 | 781.673 | 10.521 | .001 |

## Assembling Objects

Large differences between the two versions of the subtest were found for all subgroups (see Figures 30, 31, and 32). Differences are largest for lower scores while overall, males, and majority analyses show scores only differ by one point for higher scores.

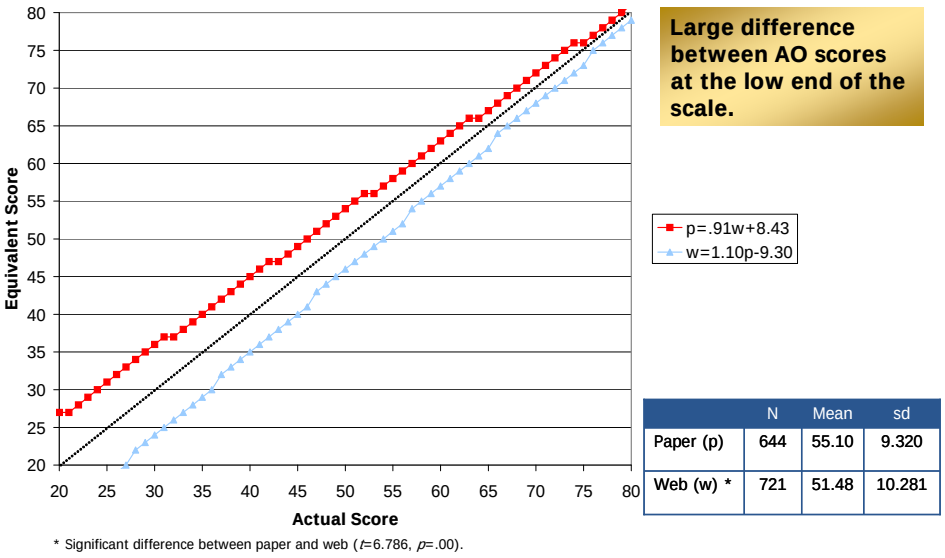
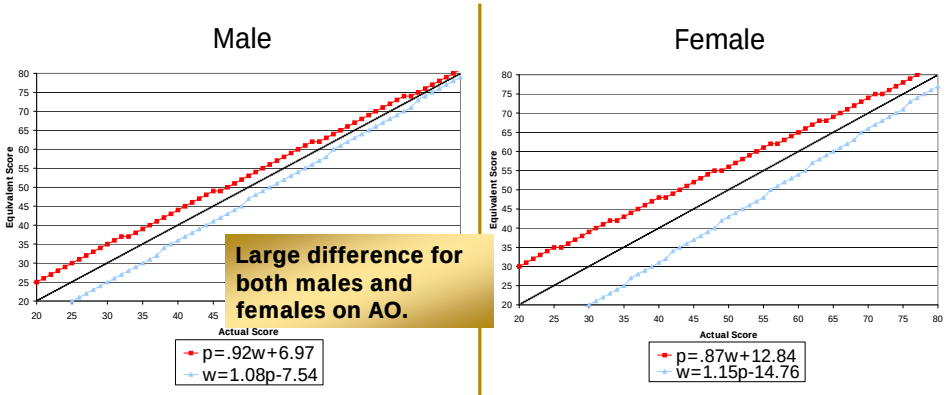



**Figure 30. Linear equating for Assembling Objects.**

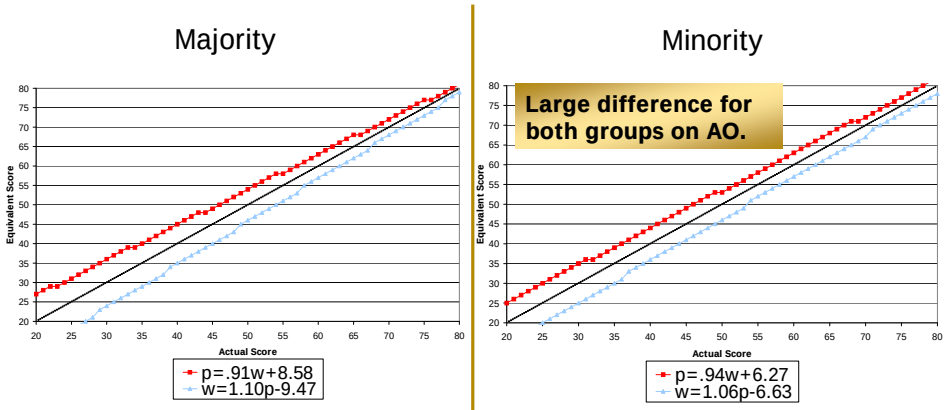



| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 510 | 55.05 | 9.529 |
| Web (w) * | 534 | 52.02 | 10.310 |

| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 87 | 56.29 | 8.215 |
| Web (w) * | 109 | 49.97 | 9.448 |

* Significant difference between paper and web for males ($t$=4.925, $p$=.00) and females ($t$=4.927, $p$=.00).

**Figure 31. Linear equating for Assembling Objects by gender.**




| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 390 | 55.87 | 9.271 |
| Web (w) * | 343 | 52.15 | 10.225 |

| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 158 | 53.77 | 9.860 |
| Web (w) * | 213 | 50.28 | 10.437 |

* Significant difference between paper and web for majority ($t$=5.165, $p$=.00) and minority ($t$=3.260, $p$=.00).

**Figure 32. Linear equating for Assembling Objects by ethnicity group.**

Differences between the two subtests' means are significant for all groups, as indicated in Table 13, with the paper version yielding higher scores than the web version.

## Table 13
## One-way ANOVAs for Assembling Objects scale scores

| Between Groups | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Overall | 4452.975 | 1 | 4452.975 | 45.999 | .000 |
| Males | 2398.373 | 1 | 2398.373 | 24.294 | .000 |
| Females | 1929.389 | 1 | 1929.389 | 24.235 | .000 |
| Majority | 2522.717 | 1 | 2522.717 | 26.651 | .000 |
| Minority | 1101.164 | 1 | 1101.164 | 10.594 | .001 |

### Armed Forces Qualification Test

The Armed Forces Qualification Test (AFQT) is a composite of three scores from the ASVAB: AR, MK, and two times the VE score. Although not generally computed while in the service and therefore not a product of the AFCT, scores were computed following this test to further compare the two versions. As Figure 33 shows, the two versions yield similar scores (1 point difference at the lowest end, increasing to a 3 point difference for higher scores); paper-based scores tend to be slightly higher.

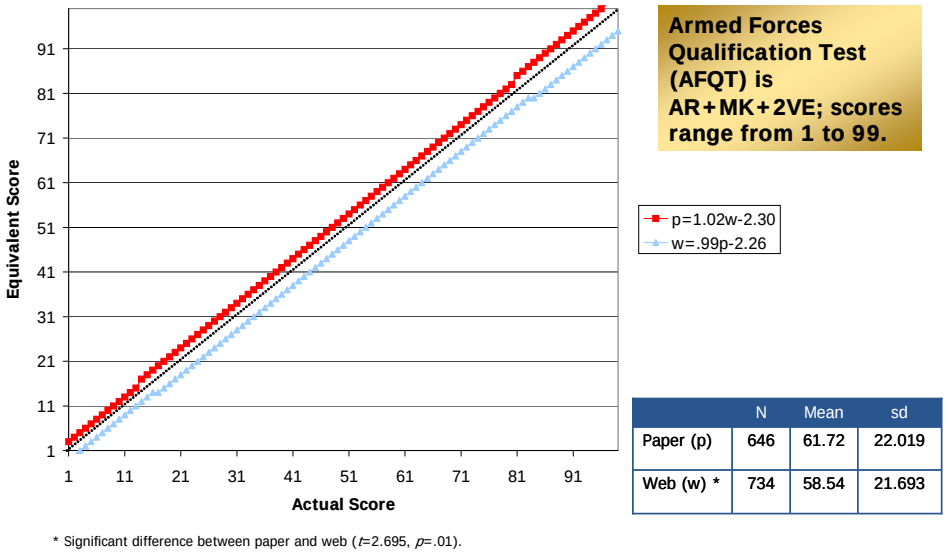
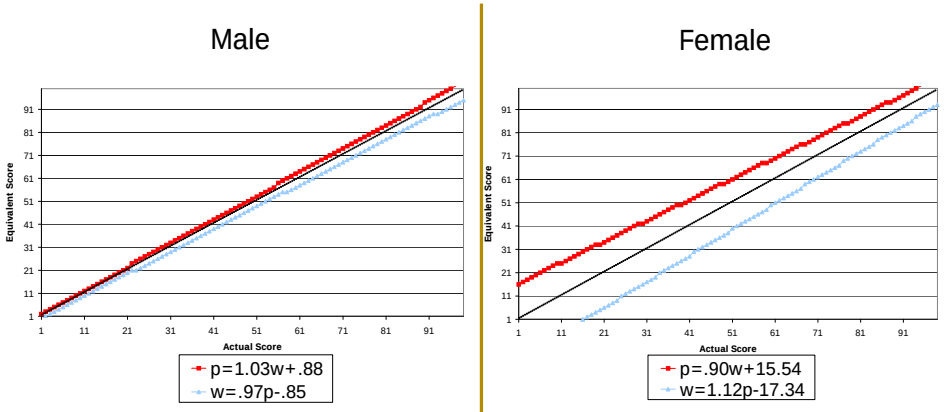



**Figure 33. Linear equating for Armed Forces Qualification Test.**

The differences for males are similar to the overall findings but differences for females are much larger (see Figure 34). Differences in female scores range from 15 at the lower end to 6 at the higher end.



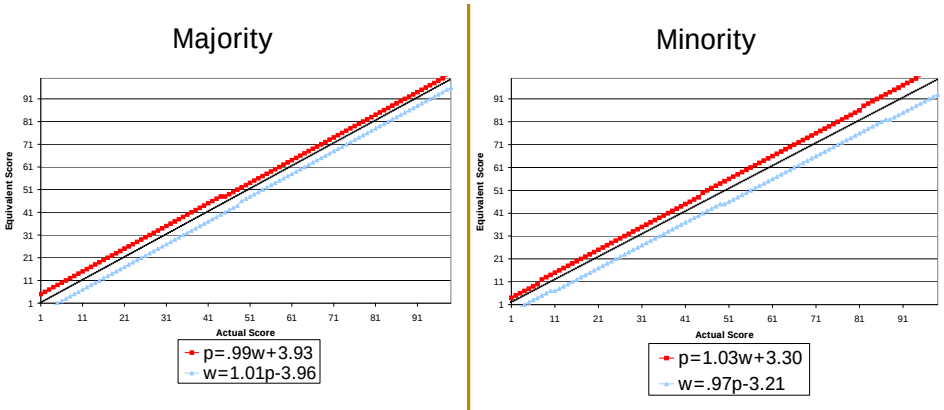

| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 511 | 63.06 | 21.972 |
| Web (w) * | 545 | 60.40 | 21.343 |

| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 87 | 62.62 | 19.524 |
| Web (w) * | 110 | 52.54 | 21.787 |

* Significant difference between paper and web for males ($t$=1.993, $p$=.05) and females ($t$=3.376, $p$=.00).

**Figure 34. Linear equating for Armed Forces Qualification Test by gender.**

Neither the majority nor the minority subgroup show differences as large as those found for females, but the two test versions are more dissimilar than was found for males (Figure 35). Differences for majority range from four points at the lower end of scores to three points at the higher end while differences for minority range from three points at the lower end to six points at the higher end.




| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 391 | 66.21 | 20.406 |
| Web (w) * | 349 | 62.88 | 20.602 |

| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 158 | 56.46 | 23.062 |
| Web (w) * | 217 | 51.76 | 22.457 |

* Significant difference between paper and web for majority ($t$=2.206, $p$=.03) minority ($t$=1.977, $p$=.05).

**Figure 35. Linear equating for Armed Forces Qualification Test by ethnicity group.**

Significant differences were found for all analysis groups, as indicated in Table 14.

**Table 14**
**One-way ANOVAs for AFQT scores**

| Between Groups | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Overall | 3465.925 | 1 | 3465.925 | 7.262 | .007 |
| Males | 1861.638 | 1 | 1861.638 | 3.972 | .047 |
| Females | 4940.142 | 1 | 4940.142 | 11.398 | .001 |
| Majority | 2045.293 | 1 | 2045.293 | 4.867 | .028 |
| Minority | 2015.660 | 1 | 2015.660 | 3.907 | .049 |

# Discussion

## Findings

The equating study presented here shows that the version of the AFCT as programmed in WebQuiz XP was fully functional. The only issues that were encountered related to connectivity of the laptops; the room as configured had many cables that were occasionally and inadvertently pulled out of the laptops.

While there are key benefits to conducting the AFCT through the web, the results shown here indicate that there are differences between the paper and web versions that need to be accounted for before using a web version Navy-wide. Of key note, paper-based scores tend to be slightly higher, significantly for PC (5 points different for low scores) and AO (7 points different for low scores). This was true for the overall group, as well as males and both majority and minority ethnicity. The differences were even higher for females (about 10 points), although this likely is influenced by the low number of females who participated.

## Testing Observations

While administering the test, there were both advantages and disadvantages observed by the test proctors. These advantages and disadvantages should be considered by Navy leadership in determining how to implement the web-based AFCT if they decide to do so.

The first overwhelming advantage was that the web-based AFCT was self-paced. Because of this, Sailors generally finished sooner than they would have on paper, where the pace is set by the slowest test-taker. Testing times for the individual subtests require a minimum of 2.5 hours for completion, plus additional time to read instructions. As seen in the web-based testing condition, some respondents finished within an hour, with at least half of the examinees done within two hours (consistent with CAT-ASVAB and results found when other tests have moved away from lock-step administration).

This shortened testing time then can return at least some Sailors to their duties, instead of spending their time waiting for fellow Sailors to complete the test.

Additionally, as designed here, there is less interaction with a test administrator, normally another Sailor. The test administrator is still needed to monitor the test-taking to ensure there is no cheating and to hand out additional paper and pencils as requested, but he or she does not have to give any additional instructions. Since the test is self-paced, this Sailor may also return to duty sooner than he/she would be able to with a paper-based test.

Because the examinee records their test answers as they take the test, there is no need for additional scanning or hand-entry of the answers, thereby reducing errors that may be associated with scanners (bubbles not aligned, incomplete fill of the bubble, 2 bubbles inadvertently marked with a succeeding question left empty, bubble not dark, etc.) or hand entry. The computer also makes immediate scoring and feedback of results a possibility.

If the test is on a computer which is password protected, or if the test continues to have an administrative password, the test requires less effort to ensure security. Multiple computers may access the same computer file of questions, instead of the need to have multiple copies of the test booklet available.

The web-based test as designed here made return to previously completed subtests nearly impossible since the examinee would have to restart the entire test. In the paper-based test, ensuring that examinees do not return to previous subtests requires close, constant vigilance by the test administrator.

The disadvantages of the web-based AFCT, as programmed, related to the inherent capabilities of a computer. All Windows-based computers have a calculator installed; the test administrators attempted to delete the calculator but it would return as a default. The calculator was removed from the Programs menu for these tests, making it more difficult to find, but the calculator program was still available and the test administrators were especially vigilant to ensure that it was not used on the test, as indicated in the paper-based instructions.

The web-based AFCT was administered through the standard version of Internet Explorer, which has several functions installed by default. One of these is the “Find” function; in the Paragraph Comprehension subtest, “Find” could be used to look for key words mentioned in the actual question.

A final disadvantage observed in the testing was the inability to draw on the test diagrams. While drawing in the test booklet is not allowed, it would still happen (the test booklets were scanned after each use to ensure there were no pencil marks; all pencil marks were erased or the booklet would no longer be used). The marks were usually either directional arrows, used by the respondent to figure out how something worked, or marks to help the examinee keep track of which answer choices were not possible. Web-based examinees could draw the diagrams on their scratch paper, however this would be an unwanted delay in a timed test; few examinees drew the diagrams on their scratch paper.

## Future Steps

While there were significant differences found, some of these may be alleviated by modifications to the testing protocol. For AO in particular, allowing grease pencils on the monitor itself or on a transparency overlay of the monitor would allow respondents to make notations similar to what often happens in paper test booklets; grease pencil markings would be relatively easy to wipe clean, similar to using the eraser when marking in a test booklet.

Differences for the PC subtest may be more difficult to alleviate. Studies have shown reading speed may be equivalent between web and paper mediums but that skimming speed is slower on a computer monitor than on paper (Muter & Maurutto, 1991). In a test setting, it is possible that more are skimming than are reading; perhaps increasing the font size or changing the font type would increase skimming (and reading) speeds and these options should be considered.

Once another variation of the test is finalized—alleviating some of the potential causes of difference—this equating study would need to be replicated. This could also work to increase the dataset and provide additional data from females for analyses, potentially eliminating many of the large differences found for females.

It is possible that no modifications can be made to the web-based version of the test so that the scores match exactly what would have been received on the paper-based version. A decision then needs to be made at the Department of Defense level as to when to stop testing modifications so that a final version can be made available. Additionally, the DoD-level working group needs to determine how to handle both paper- and web-based scores concurrently in databases, since it is unlikely all tests will be administered in a single format for the next several years. If the assumption is that most people will be moved to a web-based version of the test, then it may be appropriate to create tables that easily convert all paper-based scores to web-based scores for recording into personnel databases.

Once the decision is made to convert to a predominant web-based environment, each service will likely consider redoing their job analyses; the Navy may consider modifying cut-scores to better reflect the web-based version of the test. A concept of operations (CONOPS) also needs to be determined for the Navy that maintains test integrity while also including automated scoring with IRT and logging of scores. While a DOD version would be ideal (similar to CAT-ASVAB), this is at present not possible for ships and submarines, who may have limited or no internet connectivity. If the decision is to go completely web-based, each ship/submarine would need to have a version loaded on their servers that would populate scores into personnel files when connectivity became available.

While the web-based version of the test does seem attractive for a number of reasons including lack of printing costs, potential for increased security and accuracy, and reduced Sailor time (both administering and taking), these CONOPS issues are key to ensuring that testing continues to allow for accurate and fair gauging of rating success.

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http://eng.smartlite.it/en2/products/webquiz/index.asp

# Appendix A:
# Additional Analyses

# Additional Analyses

When the Manpower Accession Policy Working Group (MAPWG) was formally briefed on the study in January of 2008, they expressed concern that the two testing groups (paper-based and web-based) were fundamentally different, which led to the significant differences between scores for the two versions. They requested that additional analyses be conducted using ASVAB scores of record, comparing the two groups for pre-existing data.

ASVAB record data was extracted for those personnel with useable scores. A few had record data scores of 0 (predominantly for the AO sub-test, which has only recently been approved as a Navy special test added to the ASVAB). Any sub-test score that was 0 was removed from comparisons for both the record scores as well as the testing data so that those scores (and Sailors) would not impact the computation of the means and standard deviations. T-tests of independent means were conducted, comparing scores of the web-based group to the paper-based group.

## Overall results

Overall results show that there were a few significant differences between the groups prior to testing, particularly in the language areas (WK, PC, and VE), as well as in EI (see Table A-1).

**Table A-1**
**Record data from all respondents**

| | Those who took web-based AFCT | | | Those who took paper-based AFCT | | | | |
|---|---|---|---|---|---|---|---|---|
| | N | Mean | SD | N | Mean | SD | T | p |
| **GS** | 723 | 54.09 | 7.431 | 657 | 54.85 | 7.446 | -1.896 | .058 |
| **AR** | 722 | 54.76 | 6.303 | 654 | 54.90 | 6.485 | -.406 | .685 |
| **WK*** | 724 | 52.39 | 6.995 | 645 | 53.43 | 6.864 | -2.770 | .006 |
| **PC*** | 722 | 53.81 | 6.079 | 642 | 54.71 | 5.799 | -2.789 | .005 |
| **MK** | 722 | 55.93 | 5.396 | 644 | 56.26 | 5.586 | -.922 | .357 |
| **EI*** | 718 | 54.69 | 8.637 | 643 | 56.03 | 8.386 | -2.897 | .004 |
| **AS** | 714 | 51.88 | 9.115 | 642 | 52.99 | 8.511 | -2.310 | .021 |
| **MC** | 707 | 55.67 | 8.364 | 642 | 56.49 | 8.078 | -1.828 | .068 |
| **AO** | 629 | 57.17 | 6.974 | 584 | 57.63 | 7.318 | -1.121 | .263 |
| **VE*** | 722 | 53.09 | 6.295 | 641 | 54.11 | 6.103 | -3.029 | .003 |
| **AFQT** | 716 | 64.41 | 18.065 | 642 | 66.83 | 17.778 | -2.483 | .013 |

The testing data was also compared for those personnel with sufficient record data. As indicated in Table A-2, there continue to be significant differences in PC and VE, perhaps caused by the pre-existing differences discussed above. However, MC and AO now show significant differences; considering personnel were similar on MC and AO when they originally took the ASVAB, it is possible that the differences now shown are due to the mode of administration. Additionally, the pre-existing difference for EI has disappeared, again suggesting a change due to the mode of administration.

**Table A-2**
**Testing data for all respondents**

| | Those who took web-based AFCT | | | Those who took paper-based AFCT | | | | |
|---|---|---|---|---|---|---|---|---|
| | N | Mean | SD | N | Mean | SD | T | p |
| **GS** | 723 | 53.34 | 7.545 | 657 | 54.02 | 8.015 | -1.623 | .105 |
| **AR** | 722 | 51.88 | 7.629 | 654 | 51.79 | 7.739 | .217 | .828 |
| **WK** | 724 | 53.42 | 7.155 | 645 | 53.77 | 7.627 | -.876 | .381 |
| **PC*** | 722 | 50.87 | 7.679 | 642 | 53.13 | 7.026 | -5.646 | .000 |
| **MK** | 722 | 55.93 | 5.396 | 644 | 56.26 | 5.586 | -1.513 | .130 |
| **EI** | 718 | 56.74 | 11.868 | 643 | 57.77 | 11.644 | -1.613 | .107 |
| **AS** | 714 | 50.81 | 10.231 | 642 | 51.58 | 9.861 | -1.407 | .160 |
| **MC*** | 707 | 55.37 | 8.854 | 642 | 57.34 | 8.939 | -4.063 | .000 |
| **AO*** | 629 | 51.86 | 10.202 | 584 | 55.17 | 9.233 | -5.090 | .000 |
| **VE*** | 722 | 52.69 | 7.008 | 641 | 53.82 | 7.290 | -2.915 | .000 |
| **AFQT** | 716 | 58.85 | 21.628 | 642 | 61.76 | 22.011 | -2.454 | .014 |

## Gender

Record data for males in the two administration groups show no significant differences, indicating that they were reasonably similar prior to the equating study (see Table A-3). Findings for females show three differences; WK and VE are significantly different between the two groups (similar to overall) as well as MC (see Table A-4).

## Table A-3
## Record data for males

| | Those who took web-based AFCT | | | Those who took paper-based AFCT | | | T | p |
|---|---|---|---|---|---|---|---|---|
| | N | Mean | SD | N | Mean | SD | | |
| GS | 548 | 55.12 | 6.945 | 521 | 55.81 | 7.034 | -1.614 | .107 |
| AR | 547 | 55.48 | 6.201 | 517 | 55.37 | 6.354 | .286 | .775 |
| WK | 549 | 52.93 | 7.005 | 511 | 53.80 | 6.703 | -2.063 | .039 |
| PC | 548 | 54.07 | 6.121 | 508 | 54.89 | 5.872 | -2.218 | .027 |
| MK | 547 | 56.00 | 5.494 | 509 | 54.46 | 5.735 | -1.331 | .183 |
| EI | 543 | 56.16 | 8.334 | 508 | 57.28 | 8.078 | -2.210 | .027 |
| AS | 541 | 53.67 | 8.693 | 507 | 54.35 | 8.172 | -1.303 | .193 |
| MC | 535 | 57.18 | 7.936 | 507 | 57.64 | 7.912 | -.937 | .349 |
| AO | 473 | 57.63 | 6.853 | 462 | 57.92 | 7.420 | -.633 | .527 |
| VE | 548 | 53.54 | 6.292 | 508 | 54.44 | 5.996 | -2.376 | .018 |
| AFQT | 542 | 65.99 | 18.013 | 508 | 68.02 | 17.645 | -1.843 | .066 |

## Table A-4
## Record data for females

| | Those who took web-based AFCT | | | Those who took paper-based AFCT | | | T | p |
|---|---|---|---|---|---|---|---|---|
| | N | Mean | SD | N | Mean | SD | | |
| GS | 110 | 49.99 | 7.933 | 90 | 52.10 | 7.801 | -1.885 | .061 |
| AR | 110 | 52.27 | 5.809 | 90 | 53.12 | 7.166 | -.927 | .355 |
| WK* | 110 | 50.25 | 6.664 | 87 | 53.15 | 7.313 | -2.905 | .004 |
| PC | 109 | 52.53 | 5.690 | 88 | 54.61 | 5.621 | -2.565 | .011 |
| MK | 110 | 55.75 | 5.087 | 88 | 556.20 | 4.797 | -.634 | .527 |
| EI | 110 | 48.81 | 6.798 | 88 | 50.02 | 7.171 | -1.215 | .226 |
| AS | 109 | 43.80 | 5.434 | 88 | 46.06 | 6.970 | -2.557 | .011 |
| MC* | 108 | 48.83 | 5.783 | 88 | 51.42 | 6.612 | -2.924 | .004 |
| AO | 100 | 55.56 | 6.450 | 79 | 57.11 | 6.528 | -1.588 | .114 |
| VE* | 109 | 51.07 | 6.901 | 87 | 54.52 | 6.344 | -2.971 | .003 |
| AFQT | 109 | 58.57 | 16.727 | 87 | 64.95 | 18.197 | -2.551 | .012 |

The data obtained through the testing shows three significant differences for males; results for PC, MC, and AO show significant differences between administration modes where none had existed prior to our testing (see Table A-5).

## Table A-5
## Testing data for males

| | Those who took web-based AFCT | | | Those who took paper-based AFCT | | | T | p |
|---|---|---|---|---|---|---|---|---|
| | N | Mean | SD | N | Mean | SD | | |
| **GS** | 548 | 54.26 | 7.298 | 524 | 54.64 | 8.015 | -.811 | .417 |
| **AR** | 547 | 52.38 | 7.660 | 517 | 52.20 | 7.786 | .380 | .704 |
| **WK** | 549 | 53.89 | 7.213 | 511 | 54.06 | 7.796 | -.369 | .712 |
| **PC*** | 548 | 54.10 | 7.742 | 508 | 53.31 | 7.042 | -4.840 | .000 |
| **MK** | 547 | 53.51 | 6.702 | 509 | 54.07 | 7.086 | -1.320 | .187 |
| **EI** | 543 | 58.84 | 11.653 | 508 | 59.19 | 11.669 | -.486 | .627 |
| **AS** | 541 | 52.70 | 9.896 | 507 | 54.35 | 8.172 | -.476 | .634 |
| **MC*** | 535 | 56.51 | 8.789 | 507 | 58.29 | 8.912 | -3.245 | .001 |
| **AO*** | 743 | 52.39 | 10.246 | 462 | 55.18 | 9.394 | -4.337 | .000 |
| **VE** | 548 | 53.07 | 7.045 | 508 | 54.08 | 7.411 | -2.270 | .023 |
| **AFQT** | 542 | 60.45 | 21.384 | 508 | 63.09 | 21.944 | -1.974 | .049 |

There are a number of significant differences between the two groups of women when viewing the testing data for the females. As mentioned before, the two groups were significantly different for MC and VE scores prior to our testing, and these differences continue to exist (see table A-6) and the differences in WK scores are almost significantly different. In addition, GS, PC, EI, AS, and AO, as well as the AFQT score now are significantly different, possibly indicating a difference based on the mode of testing, although also likely impacted by the small number of women.

## Table A-6
## Testing data for females

| | Those who took web-based AFCT | | | Those who took paper-based AFCT | | | T | p |
|---|---|---|---|---|---|---|---|---|
| | N | Mean | SD | N | Mean | SD | | |
| **GS*** | 110 | 50.00 | 7.748 | 90 | 53.03 | 7.257 | -2.831 | .005 |
| **AR** | 110 | 49.96 | 7.212 | 90 | 51.67 | 6.722 | -1.720 | .087 |
| **WK** | 110 | 51.38 | 6.757 | 87 | 53.94 | 6.900 | -2.616 | .010 |
| **PC*** | 109 | 50.06 | 7.366 | 88 | 54.53 | 5.628 | -4.693 | .000 |
| **MK** | 110 | 51.95 | 5.927 | 88 | 53.61 | 6.510 | -1.874 | .062 |
| **EI*** | 110 | 47.84 | 8.596 | 88 | 52.90 | 9.047 | -4.021 | .000 |
| **AS*** | 109 | 42.22 | 6.148 | 88 | 44.94 | 6.464 | -3.017 | .003 |
| **MC*** | 108 | 49.98 | 7.060 | 88 | 53.98 | 7.680 | -3.792 | .000 |
| **AO*** | 100 | 49.99 | 9.615 | 79 | 56.37 | 8.426 | -4.652 | .000 |
| **VE*** | 109 | 51.04 | 6.901 | 87 | 54.52 | 6.344 | -3.635 | .000 |
| **AFQT*** | 109 | 52.77 | 21.748 | 87 | 62.62 | 19.524 | -3.295 | .001 |

## Ethnicity

As with males, no significant differences were found for record data of the majority group; the web-based majority and the paper-based majority had similar scores prior to our testing (see Table A-7). The two groups of minority personnel were significantly different on WK, PC, MK, and VE prior to testing (see Table A-8).

### Table A-7
### Record data for majority

| | Those who took web-based AFCT | | | Those who took paper-based AFCT | | | | |
|---|---|---|---|---|---|---|---|---|
| | N | Mean | SD | N | Mean | SD | T | p |
| GS | 352 | 56.03 | 6.361 | 395 | 56.65 | 6.269 | -1.340 | .181 |
| AR | 350 | 55.92 | 6.019 | 394 | 55.90 | 6.358 | .044 | .965 |
| WK | 351 | 54.20 | 6.358 | 390 | 54.58 | 6.573 | -.798 | .425 |
| PC | 351 | 54.92 | 5.829 | 388 | 55.34 | 5.579 | -1.000 | .317 |
| MK | 349 | 56.13 | 5.733 | 389 | 56.56 | 5.590 | -1.031 | .303 |
| EI | 346 | 56.64 | 7.879 | 388 | 57.68 | 7.605 | -1.818 | .069 |
| AS | 345 | 55.23 | 8.288 | 387 | 55.21 | 7.806 | .034 | .973 |
| MC | 344 | 58.16 | 7.566 | 387 | 58.26 | 7.713 | -.177 | .860 |
| AO | 308 | 57.92 | 6.768 | 356 | 58.42 | 7.182 | -.919 | .359 |
| VE | 351 | 54.71 | 5.716 | 388 | 55.10 | 5.836 | -.916 | .361 |
| AFQT | 348 | 68.94 | 16.985 | 388 | 70.00 | 16.544 | -.857 | .392 |

### Table A-8
### Record data for minority

| | Those who took web-based AFCT | | | Those who took paper-based AFCT | | | | |
|---|---|---|---|---|---|---|---|---|
| | N | Mean | SD | N | Mean | SD | T | p |
| GS | 216 | 51.00 | 7.623 | 166 | 52.57 | 7.720 | -1.984 | .048 |
| AR | 217 | 53.52 | 6.317 | 163 | 53.34 | 6.757 | .267 | .790 |
| WK* | 218 | 49.61 | 6.875 | 159 | 52.21 | 6.842 | -3.962 | .000 |
| PC* | 216 | 52.06 | 6.084 | 158 | 54.10 | 6.011 | -3.219 | .001 |
| MK* | 218 | 55.82 | 4.997 | 158 | 56.28 | 5.746 | 6.864 | .000 |
| EI | 217 | 51.99 | 8.319 | 158 | 53.27 | 8.979 | -1.423 | .156 |
| AS | 216 | 47.27 | 7.944 | 158 | 48.74 | 8.161 | -1.747 | .081 |
| MC | 212 | 52.06 | 7.930 | 158 | 53.50 | 7.685 | -1.751 | .081 |
| AO | 188 | 55.88 | 6.986 | 141 | 56.66 | 7.294 | -.983 | .326 |
| VE* | 217 | 50.57 | 6.231 | 158 | 53.12 | 6.134 | -3.939 | .000 |
| AFQT | 215 | 58.01 | 17.647 | 158 | 63.32 | 19.258 | -2.762 | .006 |

The testing found significant differences for majority personnel in two subtests: PC and AO (see Table A-9). There were no significant differences in the two groups prior to our testing, so a possible source of this difference in our tests is due to the different administration modes.

**Table A-9**
**Testing data for majority**

| | Those who took web-based AFCT | | | Those who took paper-based AFCT | | | | |
|---|---|---|---|---|---|---|---|---|
| | N | Mean | SD | N | Mean | SD | T | p |
| **GS** | 352 | 55.23 | 7.004 | 395 | 55.70 | 7.465 | -.884 | .377 |
| **AR** | 350 | 52.61 | 7.788 | 394 | 52.97 | 7.412 | -.646 | .519 |
| **WK** | 351 | 55.07 | 6.369 | 390 | 55.14 | 7.304 | -.138 | .890 |
| **PC*** | 351 | 51.74 | 7.549 | 388 | 54.05 | 6.833 | -4.366 | .000 |
| **MK** | 349 | 53.83 | 6.714 | 389 | 54.63 | 6.980 | -1.583 | .114 |
| **EI** | 346 | 59.53 | 11.616 | 388 | 59.66 | 11.256 | -.154 | .878 |
| **AS** | 345 | 54.12 | 9.691 | 387 | 53.94 | 9.411 | .255 | .799 |
| **MC** | 344 | 57.51 | 8.418 | 387 | 58.93 | 8.721 | -2.233 | .026 |
| **AO*** | 308 | 52.63 | 10.134 | 356 | 56.08 | 9.085 | -4.625 | .000 |
| **VE** | 351 | 4.13 | 6.394 | 388 | 55.09 | 7.052 | -1.931 | .054 |
| **AFQT** | 348 | 62.88 | 20.632 | 388 | 66.28 | 20.346 | -2.248- | .025 |

Four tests show significant differences between the two minority groups, two of which were not pre-existing. Significant differences were found for PC and VE, as was seen in the record data, but the differences in WK and MK no longer exist (see Table A-10). In addition, scores for MC and AO are significantly different, possibly indicating a difference between modes.

**Table A-10**
**Testing data for minority**

| | Those who took web-based AFCT | | | Those who took paper-based AFCT | | | T | p |
|---|---|---|---|---|---|---|---|---|
| | N | Mean | SD | N | Mean | SD | | |
| **GS** | 216 | 50.61 | 7.420 | 166 | 52.06 | 8.227 | -1.806 | .072 |
| **AR** | 217 | 51.14 | 7.447 | 163 | 50.18 | 8.221 | 1.189 | .235 |
| **WK** | 218 | 50.52 | 7.946 | 159 | 52.01 | 8.183 | -1.943 | .053 |
| **PC*** | 216 | 49.09 | 7.976 | 158 | 52.39 | 7.127 | -4.132 | .000 |
| **MK** | 218 | 52.03 | 6.441 | 158 | 52.50 | 7.173 | -.623 | .534 |
| **EI** | 217 | 52.66 | 11.507 | 158 | 55.33 | 11.601 | -2.211 | .028 |
| **AS** | 216 | 46.19 | 8.776 | 158 | 46.68 | 9.216 | -.522 | .602 |
| **MC*** | 212 | 51.78 | 8.580 | 158 | 54.66 | 8.688 | -3.177 | .002 |
| **AO*** | 188 | 50.15 | 10.448 | 141 | 53.71 | 9.854 | -3.133 | .002 |
| **VE*** | 217 | 49.96 | 7.689 | 158 | 52.39 | 7.605 | -3.036 | .003 |
| **AFQT** | 215 | 51.86 | 22.497 | 158 | 56.46 | 23.062 | -1.931 | .054 |

## Summary

The two groups that participated in this equating study were slightly different prior to their participation. As the tables above show, male and majority personnel were equivalent, but overall examinees as well as females and minority primarily tended to differ on the verbal tests (WK and PC, as well as the composite VE).

The results of the equating study show new statistically significant differences, especially in MC and AO. Because these differences did not exist between the groups prior to testing, it is feasible that these differences are due to the mode of administration of the test.

# Appendix B:
# Selected Portions of the Manual for Administration
# Armed Forces Classification Test (AFCT)
# Version 19G

**5. Testing Materials.**

Testing materials required for each examinee are:

a. Computer
b. Privacy Act Statement
c. Scratch paper – 2 sheets
d. Two number 2 pencils (with eraser)

Materials required for the Test Administrator are:

a. This manual
b. Sufficient computers
c. Sufficient copies of the Privacy Act Statement
d. Sufficient number 2 pencils with erasers
e. Sufficient scratch paper

**7. Preparation of computers prior to testing.**

Computers should already be set up prior to testing, but below are key steps if they aren't:

1. Screen saver should be off
2. Sound should be off
3. In Internet Explorer, no toolbars (Standard Buttons, Address Bar, Links) should be on, ONLY THE STATUS BAR should be showing (bottom of the screen). Be sure IE window is the full screen.

Computers need to be networked with the server hosting the test prior to continuing:

1. Turn the server on. You don't have to log into the machine, just turn it on.
2. Turn the computers on. Just hit enter to login.
3. Open Internet Explorer. It should default to the test home page, which says AFCT and asks for a password.
4. Minimize Internet Explorer.

Section II, part 2 for paper:

This is a research project on the AFCT, the version of the ASVAB administered while in the Navy. As this is a research project, you may choose to not do the test or stop doing the test during your time here, and there will be no penalty to you. However, if you do the test and you score better than your previous ASVAB scores, your personnel record will be updated to reflect the higher scores. If your scores are worse, your current scores will remain in your personnel file. The goal of this research is to improve the AFCT, so please do your best on the test.

If you choose to take the test, you are required to disclose your Social Security Number (SSN). Your SSN will be used to verify that the scores you make are correctly transcribed to a scoring worksheet. Any data you provide is For Official Use Only and will be maintained and used in strict confidence in accordance with Federal Laws and Regulations.

Now look at the sheet entitled Privacy Act Statement. Read the Privacy Act statement silently as I read it out loud:

Privacy Act Statement

AUTHORITY: 10 USC 133 and 3013; E.O. 9397

PRINCIPAL PURPOSE: To collect and measure an individual's aptitude for re-enlistment, re-classification, or training as a commissioned or warrant officer for assignments to various military positions.

ROUTINE USES: The scores an individual makes (if higher than their previous ASVAB scores) will be transcribed onto the appropriate military personnel records and furnished to evaluation boards and officials.

DISCLOSURE: If you choose to participate, completing this form is mandatory. Your social security number is used to verify that the score you make is correctly transcribed on your military personnel record.

I certify that I am physically and mentally fit and that I have neither given nor received unauthorized assistance in conjunction with this test.

Now read the final statement.

For PAPER ONLY:

In the upper center portion of the answer sheet there is a black printed sequence number. Write that number on the Privacy Act Statement in the blank for Sequence/Computer Number.

Print your last name and Social Security Number in the blanks and sign in the space provided.

Section II, part 2 for WEB:

Since this test is computer-based, we'll take the first few minutes so that you can get used to the mouse on the laptop in front of you. The large area below the letter keys is the mouse pad and your finger is the mouse. When you touch that area, moving your finger causes the arrow on the screen to move.

In this test you'll need to select answers by left clicking. To do this, use the left button just below the "mouse pad". Do not use the grey circle with arrows.

There are three games showing on the desktop – solitaire, spider solitaire, and minesweeper. Spend the next few minutes playing the games so you can get better acquainted with how to use the mouse. I'm going to walk around and make sure everyone understands how to use the mouse before we begin the test. If you need to take a head break, now would be the time to do it. The test may take 2-3 hours.

Walk around the room, checking on each person to be sure they can use the mouse.

I am (give your name), your Test Administrator today. I will be administering the Armed Forces Classification Test (AFCT).

This is a research project on the AFCT, the version of the ASVAB administered while in the Navy. As this is a research project, you may choose to not do the test or stop doing the test during your time here, and there will be no penalty to you. However, if you do the test and you score better than your previous ASVAB scores, your personnel record will be updated to reflect the higher scores. If your scores are worse, your current scores will remain in your personnel file. The goal of this research is to improve the AFCT, so please do your best on the test.

If you choose to take the test, you are required to disclose your Social Security Number (SSN). Your SSN will be used to verify that the scores you make are correctly transcribed to a scoring worksheet. Any data you provide is For Official Use Only and will be maintained and used in strict confidence in accordance with Federal Laws and Regulations.

Please clear your desk of everything but the laptop. Each of you will receive scratch paper and 2 pencils. Do not begin the test until you are told to do so.

Distribute 2 sheets of scratch paper, 2 pencils, and the Privacy Act Statement to each examinee, then say:

On these tests YOU SHOULD WORK AS RAPIDLY AND ACCURATELY AS YOU CAN. DO YOUR OWN WORK AND LISTEN CAREFULLY TO INSTRUCTIONS WHEN THEY ARE GIVEN. Please work quietly out of consideration for others who are also being tested.

Now look at the sheet entitled Privacy Act Statement. Read the Privacy Act statement silently as I read it out loud:

Privacy Act Statement

AUTHORITY: 10 USC 133 and 3013; E.O. 9397

PRINCIPAL PURPOSE: To collect and measure an individual's aptitude for re-enlistment, re-classification, or training as a commissioned or warrant officer for assignments to various military positions.

ROUTINE USES: The scores an individual makes (if higher than their previous ASVAB scores) will be transcribed onto the appropriate military personnel records and furnished to evaluation boards and officials.

DISCLOSURE: If you choose to participate, completing this form is mandatory. Your social security number is used to verify that the score you make is correctly transcribed on your military personnel record.

I certify that I am physically and mentally fit and that I have neither given nor received unauthorized assistance in conjunction with this test.

On the back of the laptop screen is a number written on a yellow square. Write that number on the Privacy Act Statement in the blank for Sequence/Computer Number.

Print your last name and Social Security Number in the blanks and sign in the space provided.

You will be selecting answers on the laptop in front of you. Use the scratch paper which was given to you for any figuring you need to do. Return this scratch paper with your other materials when you finish the test. Calculators of ANY kind are not allowed on the test.

The AFCT contains 9 tests. Each test has its own instructions and time limit, which you will see before each test. When you finish a test you may check your work in that test ONLY. Once you are completely done with a test, you may continue on to the next test.

For each question, be sure to pick the BEST ONE of the possible answers listed. When you have decided which one of the choices given is the best answer to a question, select that answer by clicking in the circle in front of that choice.

Answer as many questions as possible. Do not spend too much time on any one question. Work QUICKLY, but work ACCURATELY.

Each test is timed, and the time remaining will be shown in the bottom left corner of the screen. If you need additional scratch paper or pencils at any time during the test, please raise your hand and I will bring them to you.

Are there any questions?

Now, maximize Internet Explorer and log into the test using the password nprst2006. Each test begins with instructions that are not timed. Read through each set of instructions before beginning the test. Read through the instructions for part 1 now, and then enter your SSN in the box at the bottom before clicking the Begin button to start the test.

Examinees will raise their hands when they are done. Press the power button (machine will hibernate), collect all materials, and then quietly dismiss the individual.

# AFCT Q&A

Q: What if I suspect someone is cheating?

A: Hover around. If you definitely notice someone is cheating, at the end of the section, ask them to pack up their materials, take back the Privacy Act, and note the incident on the form.

Q: What if someone decides that they don't want to continue the test?

A: Take their materials and thank them for their time. Note the incident on their Privacy Act.

Q: What if someone has a question about one of their test questions?

A: We're not allowed to answer any questions concerning the test.

Q: In the computer administration of the test, what if someone inadvertently gets out of the test (closes Internet Explorer) or can't continue?

A: Go back into Internet Explorer and have them start from the beginning. After entering in their SSN and clicking Next through the first test (stopping after pressing the SUBMIT button), go to View – Toolbars – Address Bar. After the http://164.94.7.__, type in the filename of the section they should be going to:

Part 2 – afct2.asp

Part 3 – afct3.asp

Part 4 – afct4.asp

Etc

Close the Address Bar again (View – Toolbars – de-check Address Bar). Make note of their SSN and what happened.

Q: For computer administration of the test, what if one of the computers just dies?

A: Each room should have backups (they will have a yellow sticky that says B_) that should be "plug and play". Close the inoperative computer, disconnect the power and the network cable from the back of the inoperative computer, and plug the cables into the backup machine. Turn the machine on, open Internet Explorer, and continue on as listed in the FAQ above. Make note of what happened, including what computer became inoperative and what backup you used, as well as noting who it was and what section they went to.

Q: How do we find out our scores?

A: Since this is part of a research project, the tests until we have all our data (likely a few months). If you haven't heard anything before December, contact Zannette.uriell@navy.mil .

Q: What if I don't want to be reclassified?

A: Respondents are not automatically reclassified based upon the test scores.

# Appendix C:
# Privacy Act Statement

## Privacy Act Statement

AUTHORITY: 10 USC 133 and 3013; E.O. 9397

PRINCIPAL PURPOSE: To collect and measure an individual's aptitude for re-enlistment, re-classification, or training as a commissioned or warrant officer for assignments to various military positions.

ROUTINE USES: The scores an individual makes (if higher than their previous ASVAB scores) will be transcribed onto the appropriate military personnel records and furnished to evaluation boards and officials.

DISCLOSURE: If you choose to participate, completing this form is mandatory. Your social security number is used to verify that the score you make is correctly transcribed on your military personnel record.

I certify that I am physically and mentally fit and that I have neither given nor received unauthorized assistance in conjunction with this test.

_____

**Sequence/Computer Number**

_____

**Last Name**

_____

**Social Security No.**

---

**SIGNATURE**

# Appendix D:
# Scoring

# AFCT Scoring in SAS

```
options center pageno=1 nodate ls=124 ps=66; /*for PDF ls=129, ps=71*/
data _null_; call symput('cdate', put(date(), weekdate17.)); run;
data _null_; call symput('ctime', put(time(), time8.)); run;
footnote1 'Source: Navy Personnel Research, Studies & Technology, NPRST/PERS-
1';
footnote2 "David L. Alderton, Ph.D. 901/874-4633; run &cdate. at &ctime. ";
/*************************************************************************
*******************/
/*This will perform the IRT scoring of the subtests... but does not include
version differences */
/*This also computes the standards scores from thetas and the AFQT from
standard scores. */
/*I used several numerical examples to test, including those given by Dan and
some others. */
/*There are no controls in here for missing, incomplete or messy data which
needs to be watched.*/
/*************************************************************************
*******************/

libname afct "Z:\ASVAB06\SCORING"; /*lib name for my computer...*/
/*******************************************************/
/*isolate parms, rename them, and merge them together...*/
/*I just cut and pasted this from the Excel file. I only*/
/*have the version 1 data (top of file) but it would be */
/*easy to modify for both. */
/*******************************************************/
data afct.parms;
 input subtest $2. inum a b c;
 cards;
GS    1     0.91436     -0.78555    0.14865
GS    2     0.47381     -2.64284    0.18462
GS    3     0.62907     -2.93499    0.20101
GS    4     0.72723     -1.24738    0.2784
GS    5     0.58742     -1.47272    0.27789
GS    6     0.88309     -0.99238    0.20458
GS    7     0.39527     -2.65297    0.25698
GS    8     0.62042     -0.94736    0.17202
GS    9     0.62517     0.01806     0.37433
GS    10    0.79165     -0.3915     0.25134
GS    11    1.018 -0.29386    0.32875
GS    12    0.73272     -0.90835    0.1738
GS    13    0.65149     -0.01085    0.06584
GS    14    0.94343     0.1288      0.21421
GS    15    0.71347     0.69584     0.14951
GS    16    0.67643     0.24637     0.18816
GS    17    0.49969     0.06832     0.21698
GS    18    0.66381     0.42804     0.14121
GS    19    0.75412     1.27854     0.38795
GS    20    0.51658     0.72605     0.31128
GS    21    0.40946     0.60364     0.14844
GS    22    0.95975     1.56912     0.0843
GS    23    1.085 1.86188     0.23835
```

| | | | | |
|---|---|---|---|---|
| GS | 24 | 0.62037 | 2.28963 | 0.08836 |
| GS | 25 | 0.8328 | 1.44953 | 0.11436 |
| AR | 1 | 0.69161 | -2.37083 | 0.17583 |
| AR | 2 | 0.53495 | -2.80441 | 0.15007 |
| AR | 3 | 1.06292 | -1.60186 | 0.07038 |
| AR | 4 | 0.69981 | -0.8137 | 0.10938 |
| AR | 5 | 0.83974 | -1.00857 | 0.08162 |
| AR | 6 | 1.4909 | -0.17713 | 0.15836 |
| AR | 7 | 0.9524 | -0.72321 | 0.14032 |
| AR | 8 | 0.93455 | -0.89134 | 0.16704 |
| AR | 9 | 0.97787 | -0.44061 | 0.02216 |
| AR | 10 | 1.26494 | -0.27203 | 0.19634 |
| AR | 11 | 0.97071 | -0.89672 | 0.05369 |
| AR | 12 | 0.81582 | -0.53374 | 0.1798 |
| AR | 13 | 1.05432 | -0.09479 | 0.13462 |
| AR | 14 | 1.187 -0.14862 | 0.16084 | |
| AR | 15 | 1.09468 | 1.412 0.42045 | |
| AR | 16 | 0.51542 | -0.06039 | 0.12794 |
| AR | 17 | 1.07013 | -0.05964 | 0.24954 |
| AR | 18 | 1.18848 | 0.78574 | 0.19108 |
| AR | 19 | 0.92195 | 0.81313 | 0.37857 |
| AR | 20 | 1.10426 | 0.79569 | 0.21308 |
| AR | 21 | 1.25263 | 0.66573 | 0.26127 |
| AR | 22 | 1.22938 | 1.06802 | 0.20573 |
| AR | 23 | 0.87833 | -0.19689 | 0.18008 |
| AR | 24 | 1.91382 | 1.07465 | 0.28383 |
| AR | 25 | 1.18448 | 1.12197 | 0.1856 |
| AR | 26 | 1.12751 | 1.13302 | 0.32535 |
| AR | 27 | 2.02064 | 1.2274 | 0.2139 |
| AR | 28 | 1.10695 | 1.12523 | 0.26605 |
| AR | 29 | 1.23125 | 1.50646 | 0.25046 |
| AR | 30 | 2.05102 | 1.33308 | 0.14229 |
| WK | 1 | 0.94623 | -1.99913 | 0.06185 |
| WK | 2 | 1.02139 | -2.42811 | 0.16112 |
| WK | 3 | 0.95334 | -2.70973 | 0.14682 |
| WK | 4 | 0.93721 | -2.08811 | 0.07391 |
| WK | 5 | 1.10676 | -1.81998 | 0.12403 |
| WK | 6 | 1.09404 | -1.4362 | 0.14317 |
| WK | 7 | 0.77163 | -2.42383 | 0.11548 |
| WK | 8 | 1.53072 | -1.22798 | 0.23881 |
| WK | 9 | 0.88658 | -1.60389 | 0.06828 |
| WK | 10 | 1.19039 | -1.60244 | 0.19522 |
| WK | 11 | 1.24316 | -2.0244 | 0.13798 |
| WK | 12 | 1.29483 | -1.53161 | 0.27972 |
| WK | 13 | 1.02709 | -0.66848 | 0.13248 |
| WK | 14 | 1.00874 | -0.49049 | 0.154 |
| WK | 15 | 1.39306 | -1.26894 | 0.22801 |
| WK | 16 | 1.2093 | -0.99866 | 0.25079 |
| WK | 17 | 0.85414 | -1.50791 | 0.09912 |
| WK | 18 | 0.71445 | -1.07432 | 0.21296 |
| WK | 19 | 1.3733 | -0.31955 | 0.23958 |
| WK | 20 | 0.85212 | -0.60071 | 0.35207 |
| WK | 21 | 1.12563 | -0.08497 | 0.5 |
| WK | 22 | 1.58637 | -0.23732 | 0.29288 |
| WK | 23 | 1.38671 | -0.03478 | 0.41813 |
| WK | 24 | 1.62807 | 0.40636 | 0.17273 |
| WK | 25 | 0.55365 | -0.18213 | 0.13315 |

| | | | | |
|---|---|---|---|---|
| WK | 26 | 1.59244 | 0.44838 | 0.31194 |
| WK | 27 | 1.68835 | 0.14143 | 0.36996 |
| WK | 28 | 1.03606 | -0.35464 | 0.25983 |
| WK | 29 | 0.91295 | 1.07383 | 0.22502 |
| WK | 30 | 1.16759 | 0.85341 | 0.31975 |
| WK | 31 | 1.58561 | 0.88667 | 0.36568 |
| WK | 32 | 1.10822 | 0.7892 | 0.11174 |
| WK | 33 | 0.84336 | 1.74273 | 0.16347 |
| WK | 34 | 0.7019 | 0.80273 | 0.36277 |
| WK | 35 | 0.70198 | 0.7401 | 0.18915 |
| PC | 1 | 0.93677 | -1.30059 | 0.18034 |
| PC | 2 | 0.68608 | -1.13724 | 0.14735 |
| PC | 3 | 0.9056 | -1.33379 | 0.1188 |
| PC | 4 | 1.31657 | -0.6578 | 0.11826 |
| PC | 5 | 0.65822 | -1.42087 | 0.07882 |
| PC | 6 | 0.47424 | -1.77563 | 0.07943 |
| PC | 7 | 0.71842 | -1.18292 | 0.10859 |
| PC | 8 | 1.0989 | -0.57203 | 0.11593 |
| PC | 9 | 0.52058 | -0.76966 | 0.14157 |
| PC | 10 | 1.03986 | -1.86214 | 0.12344 |
| PC | 11 | 0.57626 | -0.93273 | 0.13629 |
| PC | 12 | 0.75584 | 0.31241 | 0.1931 |
| PC | 13 | 1.16951 | 0.64189 | 0.15481 |
| PC | 14 | 1.53557 | 0.15254 | 0.17975 |
| PC | 15 | 1.52707 | 0.27197 | 0.20495 |
| MK | 1 | 0.48608 | -2.27829 | 0.22232 |
| MK | 2 | 0.75602 | -1.65131 | 0.15721 |
| MK | 3 | 0.7061 | -2.51714 | 0.15603 |
| MK | 4 | 0.83788 | -0.20459 | 0.21893 |
| MK | 5 | 1.03099 | -0.54983 | 0.18116 |
| MK | 6 | 0.91807 | -0.85209 | 0.12924 |
| MK | 7 | 1.11046 | 0.09746 | 0.40807 |
| MK | 8 | 1.37977 | -0.14145 | 0.19052 |
| MK | 9 | 1.15755 | 0.09751 | 0.04072 |
| MK | 10 | 1.00277 | -0.12153 | 0.26868 |
| MK | 11 | 1.07472 | -0.31053 | 0.12026 |
| MK | 12 | 0.76672 | 0.39425 | 0.04302 |
| MK | 13 | 1.39979 | 0.47199 | 0.27006 |
| MK | 14 | 1.14591 | 0.49367 | 0.30219 |
| MK | 15 | 0.71741 | 0.08486 | 0.07646 |
| MK | 16 | 0.83677 | 1.07672 | 0.20505 |
| MK | 17 | 1.39926 | 0.72736 | 0.48806 |
| MK | 18 | 0.8545 | 0.33316 | 0.14661 |
| MK | 19 | 1.07006 | 0.6619 | 0.08507 |
| MK | 20 | 1.03234 | 0.66915 | 0.17034 |
| MK | 21 | 1.28953 | 0.25302 | 0.08505 |
| MK | 22 | 1.17254 | 1.1191 | 0.14822 |
| MK | 23 | 0.90738 | 0.85672 | 0.08214 |
| MK | 24 | 1.8991 | 1.15848 | 0.21171 |
| MK | 25 | 1.55167 | 1.29933 | 0.22083 |
| EI | 1 | 0.54128 | -1.40113 | 0.09168 |
| EI | 2 | 0.44512 | -2.19275 | 0.16594 |
| EI | 3 | 0.7749 | -0.30943 | 0.19301 |
| EI | 4 | 1.08727 | 0.49554 | 0.39446 |
| EI | 5 | 0.57896 | -0.3041 | 0.06633 |
| EI | 6 | 0.63905 | 0.12713 | 0.31333 |
| EI | 7 | 0.61368 | -0.13805 | 0.20155 |

| | | | | |
|---|---|---|---|---|
| EI | 8 | 0.43312 | -2.16243 | 0.0974 |
| EI | 9 | 0.63808 | -0.6724 | 0.10262 |
| EI | 10 | 0.59113 | 0.23785 | 0.16543 |
| EI | 11 | 0.40447 | -1.44321 | 0.10542 |
| EI | 12 | 1.13622 | 0.93676 | 0.18266 |
| EI | 13 | 0.74173 | 1.10333 | 0.10825 |
| EI | 14 | 1.36233 | 0.97357 | 0.26708 |
| EI | 15 | 0.61123 | 0.75783 | 0.11334 |
| EI | 16 | 1.22852 | 1.10599 | 0.21568 |
| EI | 17 | 3.39299 | 2.54553 | 0.23674 |
| EI | 18 | 1.35882 | 1.49817 | 0.17364 |
| EI | 19 | 1.40809 | 1.92177 | 0.28898 |
| EI | 20 | 1.65236 | 2.0484 | 0.14688 |
| AS | 1 | 0.72604 | -0.81937 | 0.18747 |
| AS | 2 | 0.94108 | -1.23619 | 0.22178 |
| AS | 3 | 1.02158 | -1.08821 | 0.1033 |
| AS | 4 | 0.88189 | -0.31706 | 0.16216 |
| AS | 5 | 0.41232 | -0.52765 | 0.08818 |
| AS | 6 | 0.96361 | 0.0404 | 0.11989 |
| AS | 7 | 2.04821 | 0.56323 | 0.4015 |
| AS | 8 | 0.52229 | -0.11796 | 0.14273 |
| AS | 9 | 1.32283 | 0.76135 | 0.32233 |
| AS | 10 | 0.78761 | 0.96572 | 0.48112 |
| AS | 11 | 0.79827 | 0.01639 | 0.11234 |
| AS | 12 | 2.01073 | 1.09202 | 0.49381 |
| AS | 13 | 0.64198 | 0.39584 | 0.03703 |
| AS | 14 | 0.67502 | 1.10998 | 0.5 |
| AS | 15 | 0.35589 | -0.11162 | 0.07506 |
| AS | 16 | 0.83379 | 0.91499 | 0.07623 |
| AS | 17 | 0.96923 | 0.57023 | 0.17139 |
| AS | 18 | 2.05555 | 0.68303 | 0.26783 |
| AS | 19 | 0.44447 | 0.43339 | 0.07009 |
| AS | 20 | 1.31577 | 1.02899 | 0.18656 |
| AS | 21 | 1.12678 | 1.3408 | 0.21803 |
| AS | 22 | 0.95009 | 1.36492 | 0.16984 |
| AS | 23 | 1.07364 | 1.67572 | 0.15328 |
| AS | 24 | 1.86967 | 1.08781 | 0.22078 |
| AS | 25 | 1.69923 | 1.27657 | 0.1821 |
| MC | 1 | 0.74279 | 0.18245 | 0.16946 |
| MC | 2 | 0.80909 | -0.48081 | 0.24885 |
| MC | 3 | 0.97807 | -1.08137 | 0.09415 |
| MC | 4 | 0.58193 | -0.5386 | 0.07614 |
| MC | 5 | 0.5678 | 0.45434 | 0.11108 |
| MC | 6 | 1.06938 | 0.08375 | 0.11457 |
| MC | 7 | 0.55806 | -0.91499 | 0.29483 |
| MC | 8 | 0.84652 | 0.20709 | 0.08688 |
| MC | 9 | 0.86135 | 0.6525 | 0.33261 |
| MC | 10 | 0.81386 | 0.89453 | 0.26505 |
| MC | 11 | 0.72131 | 0.40877 | 0.12841 |
| MC | 12 | 1.15143 | 0.78216 | 0.39641 |
| MC | 13 | 0.60165 | -0.0506 | 0.17606 |
| MC | 14 | 0.86743 | 0.29763 | 0.04723 |
| MC | 15 | 0.99059 | 1.75212 | 0.18112 |
| MC | 16 | 0.55576 | 0.23291 | 0.11014 |
| MC | 17 | 0.77001 | 0.53024 | 0.09702 |
| MC | 18 | 1.08954 | 1.74088 | 0.34716 |
| MC | 19 | 0.71698 | 0.33447 | 0.22632 |

```
MC    20    0.79906     1.12321     0.20126
MC    21    0.56447     0.69682     0.03684
MC    22    1.39813     0.84086     0.25107
MC    23    0.8079      1.34906     0.1776
MC    24    0.87742     1.83394     0.18349
MC    25    0.79277     1.02826     0.22463
AO    1     0.92604     0.27877     0.41604
AO    2     1.63548     -0.40704    0.37784
AO    3     1.3188      -0.44956    0.39579
AO    4     0.98753     -0.42992    0.30135
AO    5     1.25043     -0.19651    0.33863
AO    6     0.92736     -0.26473    0.4227
AO    7     0.9625      -0.26908    0.42695
AO    8     1.43875     0.02796     0.29233
AO    9     1.25061     0.14978     0.27594
AO    10    1.0184      0.32411     0.25874
AO    11    0.55062     1.26054     0.27527
AO    12    0.72643     -0.15407    0.29664
AO    13    1.57116     -1.49674    0.18803
AO    14    0.93175     -1.19936    0.08545
AO    15    1.34623     -1.28518    0.02998
AO    16    0.88941     -1.13276    0.04437
AO    17    1.46408     -1.12058    0.04654
AO    18    0.90133     -1.15894    0.05187
AO    19    0.68892     -0.87208    0.04935
AO    20    1.42837     -0.81359    0.21848
AO    21    1.20289     -0.72515    0.22876
AO    22    1.53127     -0.51003    0.20649
AO    23    0.89915     -0.40272    0.19925
AO    24    1.16498     -0.30876    0.21703
AO    25    0.48491     0.08342     0.1219
;
run;
/*********************************************/
/*begin creating the 1-record parameter file...*/
/*This could be looped by didn't seem worth it */
/*********************************************/
data parms; set afct.parms; run; /*Load afct.parms into memory... a little
faster*/
/*GS*/ /*create and label the a, b, c parameters for easy array usage later*/
proc transpose data=parms out=GSa prefix=GSa; where subtest='GS'; var a; run;
proc transpose data=parms out=GSb prefix=GSb; where subtest='GS'; var b; run;
proc transpose data=parms out=GSc prefix=GSc; where subtest='GS'; var c; run;
data GSparms; merge GSa(drop=_name_) GSb(drop=_name_) GSc(drop=_name_); run;
/*AR*/
proc transpose data=parms out=ARa prefix=ARa; where subtest='AR'; var a; run;
proc transpose data=parms out=ARb prefix=ARb; where subtest='AR'; var b; run;
proc transpose data=parms out=ARc prefix=ARc; where subtest='AR'; var c; run;
data ARparms; merge ARa(drop=_name_) ARb(drop=_name_) ARc(drop=_name_); run;
/*WK*/
proc transpose data=parms out=WKa prefix=WKa; where subtest='WK'; var a; run;
proc transpose data=parms out=WKb prefix=WKb; where subtest='WK'; var b; run;
proc transpose data=parms out=WKc prefix=WKc; where subtest='WK'; var c; run;
data WKparms; merge WKa(drop=_name_) WKb(drop=_name_) WKc(drop=_name_); run;
/*PC*/
proc transpose data=parms out=PCa prefix=PCa; where subtest='PC'; var a; run;
proc transpose data=parms out=PCb prefix=PCb; where subtest='PC'; var b; run;
```

```
proc transpose data=parms out=PCc prefix=PCc; where subtest='PC'; var c; run;
data PCparms; merge PCa(drop=_name_) PCb(drop=_name_) PCc(drop=_name_); run;
/*MK*/
proc transpose data=parms out=MKa prefix=MKa; where subtest='MK'; var a; run;
proc transpose data=parms out=MKb prefix=MKb; where subtest='MK'; var b; run;
proc transpose data=parms out=MKc prefix=MKc; where subtest='MK'; var c; run;
data MKparms; merge MKa(drop=_name_) MKb(drop=_name_) MKc(drop=_name_); run;
/*EI*/
proc transpose data=parms out=EIa prefix=EIa; where subtest='EI'; var a; run;
proc transpose data=parms out=EIb prefix=EIb; where subtest='EI'; var b; run;
proc transpose data=parms out=EIc prefix=EIc; where subtest='EI'; var c; run;
data EIparms; merge EIa(drop=_name_) EIb(drop=_name_) EIc(drop=_name_); run;
/*AS*/
proc transpose data=parms out=ASa prefix=ASa; where subtest='AS'; var a; run;
proc transpose data=parms out=ASb prefix=ASb; where subtest='AS'; var b; run;
proc transpose data=parms out=ASc prefix=ASc; where subtest='AS'; var c; run;
data ASparms; merge ASa(drop=_name_) ASb(drop=_name_) ASc(drop=_name_); run;
/*MC*/
proc transpose data=parms out=MCa prefix=MCa; where subtest='MC'; var a; run;
proc transpose data=parms out=MCb prefix=MCb; where subtest='MC'; var b; run;
proc transpose data=parms out=MCc prefix=MCc; where subtest='MC'; var c; run;
data MCparms; merge MCa(drop=_name_) MCb(drop=_name_) MCc(drop=_name_); run;
/*AO... not really necessary*/
proc transpose data=parms out=AOa prefix=AOa; where subtest='AO'; var a; run;
proc transpose data=parms out=AOb prefix=AOb; where subtest='AO'; var b; run;
proc transpose data=parms out=AOc prefix=AOc; where subtest='AO'; var c; run;
data AOparms; merge AOa(drop=_name_) AOb(drop=_name_) AOc(drop=_name_); run;

/*Gather into 1 record of 684 variables to merge with individual subject
records*/
data afct.IRTparms;
 merge GSparms ARparms WKparms PCparms MKparms EIparms ASparms MCparms
AOparms;
 GSitems=25; ARitems=30; WKitems=35; PCitems=15; MKitems=25;
 EIitems=20; ASitems=25; MCitems=25; AOitems=25;
run;
proc import datafile="Z:\ASVAB06\data\afct_complete_SAS.csv" out=WORK.ZSAS
dbms=csv replace;
delimiter=",";
getnames=yes;
run;
proc sort data=WORK.ZSAS; by SSN; run; /*for later merges*/
proc sql; /*This creates a Cartesian join... the parmeters record joined to
each person*/
 create table WithParm as
 select *
 from WORK.ZSAS, afct.IRTparms;
quit;
/*****************************************************************/
/*The next steps do the subtest scoring and outputs theta and ID only*/
/* this could have been done in a macro loop but it was quicker to */
/* just to cut and paste, replace the subtest prefix and # of items.*/
/* I tested this code against numerical examples in Dan's PDF. */
/*****************************************************************/
data ScoreGS;
 set WithParm (keep=SSN GSa1-GSa25 GSb1-GSb25 GSc1-GSc25 CGS01-CGS25
GSitems);
```

```
 nitems=25;
 /*initialize constants*/
 ta=-4; tb=4; fpd=0; mu=0; s=1;
 /*set arrays*/
 array a(25) GSa1-GSa25;
 array b(25) GSb1-GSb25;
 array c(25) GSc1-GSc25;
 array u(25) CGS01-CGS25;
 /*now get initial estimate of fa on the first pass through the data*/
       do i = 1 to nitems;
       expval=exp(a(i)*1.7*(ta-b(i))); /*note in first call, theta=ta*/
             fpd = fpd + a(i)*1.7*(-1. + 1./(1. + expval) + u(i) -
(c(i)*u(i))/(c(i) + expval));
       end;
       fa = fpd + (mu - ta)/s**2 ; /*note in first call, theta=ta*/
 /*first part worked... and matches Dan's cycle 0 value for fa=4.30928*/
 /*now get initial estimate of fp on the second pass through the data*/
 /*second part worked... and matches Dan's cycle 1 value for fp= -0.27936*/
 /*now wrap it in the 15 cycle iteration for final theta*/
      do krep = 1 to 15;
       tp=(ta+tb)/2;
       fpd=0 ;
       do i = 1 to nitems;
       expval=exp(a(i)*1.7*(tp-b(i))); /*note in second call, theta=tp*/
             fpd = fpd + a(i)*1.7*(-1. + 1./(1. + expval) + u(i) -
(c(i)*u(i))/(c(i) + expval));
       end;
       fp = fpd + (mu - tp)/s**2 ; /*note in second call, theta=tp*/
       if fp = 0 then stop ;
       else if fa*fp > 0 then
       do;
             ta=tp; fa=fp;
             end;
       else tb=tp;
       end;
       GS_theta=(ta+tb)/2;
 keep ssn GS_theta ;
run;

data ScoreAR;
 set WithParm (keep=SSN ARa1-ARa30 ARb1-ARb30 ARc1-ARc30 CAR01-CAR30
ARitems);
 nitems=30;
 /*initialize constants*/
 ta=-4; tb=4; fpd=0; mu=0; s=1;
 /*set arrays*/
 array a(30) ARa1-ARa30;
 array b(30) ARb1-ARb30;
 array c(30) ARc1-ARc30;
 array u(30) CAR01-CAR30;
 /*now get initial estimate of fa on the first pass through the data*/
       do i = 1 to nitems;
       expval=exp(a(i)*1.7*(ta-b(i))); /*note in first call, theta=ta*/
             fpd = fpd + a(i)*1.7*(-1. + 1./(1. + expval) + u(i) -
(c(i)*u(i))/(c(i) + expval));
       end;
       fa = fpd + (mu - ta)/s**2 ; /*note in first call, theta=ta*/
```

```
 /*first part worked... and matches Dan's cycle 0 value for fa=4.30928*/
 /*now get initial estimate of fp on the second pass through the data*/
 /*second part worked... and matches Dan's cycle 1 value for fp= -0.27936*/
 /*now wrap it in the 15 cycle iteration for final theta*/
      do krep = 1 to 15;
       tp=(ta+tb)/2;
       fpd=0 ;
       do i = 1 to nitems;
       expval=exp(a(i)*1.7*(tp-b(i))); /*note in second call, theta=tp*/
             fpd = fpd + a(i)*1.7*(-1. + 1./(1. + expval) + u(i) -
(c(i)*u(i))/(c(i) + expval));
       end;
       fp = fpd + (mu - tp)/s**2 ; /*note in second call, theta=tp*/
       if fp = 0 then stop ;
       else if fa*fp > 0 then
       do;
             ta=tp; fa=fp;
             end;
       else tb=tp;
       end;
       AR_theta=(ta+tb)/2;
 keep ssn AR_theta ;
run;

data ScoreWK;
 set WithParm (keep=SSN WKa1-WKa35 WKb1-WKb35 WKc1-WKc35 CWK01-CWK35
WKitems);
 nitems=35;
 /*initialize constants*/
 ta=-4; tb=4; fpd=0; mu=0; s=1;
 /*set arrays*/
 array a(35) WKa1-WKa35;
 array b(35) WKb1-WKb35;
 array c(35) WKc1-WKc35;
 array u(35) CWK01-CWK35;
 /*now get initial estimate of fa on the first pass through the data*/
       do i = 1 to nitems;
       expval=exp(a(i)*1.7*(ta-b(i))); /*note in first call, theta=ta*/
             fpd = fpd + a(i)*1.7*(-1. + 1./(1. + expval) + u(i) -
(c(i)*u(i))/(c(i) + expval));
       end;
       fa = fpd + (mu - ta)/s**2 ; /*note in first call, theta=ta*/
 /*first part worked... and matches Dan's cycle 0 value for fa=4.30928*/
 /*now get initial estimate of fp on the second pass through the data*/
 /*second part worked... and matches Dan's cycle 1 value for fp= -0.27936*/
 /*now wrap it in the 15 cycle iteration for final theta*/
      do krep = 1 to 15;
       tp=(ta+tb)/2;
       fpd=0 ;
       do i = 1 to nitems;
       expval=exp(a(i)*1.7*(tp-b(i))); /*note in second call, theta=tp*/
             fpd = fpd + a(i)*1.7*(-1. + 1./(1. + expval) + u(i) -
(c(i)*u(i))/(c(i) + expval));
       end;
       fp = fpd + (mu - tp)/s**2 ; /*note in second call, theta=tp*/
       if fp = 0 then stop ;
       else if fa*fp > 0 then
```

```
       do;
             ta=tp; fa=fp;
             end;
       else tb=tp;
       end;
       WK_theta=(ta+tb)/2;
 keep ssn WK_theta ;
run;

data ScorePC;
 set WithParm (keep=SSN PCa1-PCa15 PCb1-PCb15 PCc1-PCc15 CPC01-CPC15
PCitems);
 nitems=15;
 /*initialize constants*/
 ta=-4; tb=4; fpd=0; mu=0; s=1;
 /*set arrays*/
 array a(15) PCa1-PCa15;
 array b(15) PCb1-PCb15;
 array c(15) PCc1-PCc15;
 array u(15) CPC01-CPC15;
 /*now get initial estimate of fa on the first pass through the data*/
       do i = 1 to nitems;
       expval=exp(a(i)*1.7*(ta-b(i))); /*note in first call, theta=ta*/
             fpd = fpd + a(i)*1.7*(-1. + 1./(1. + expval) + u(i) -
(c(i)*u(i))/(c(i) + expval));
       end;
       fa = fpd + (mu - ta)/s**2 ; /*note in first call, theta=ta*/
 /*first part worked... and matches Dan's cycle 0 value for fa=4.30928*/
 /*now get initial estimate of fp on the second pass through the data*/
 /*second part worked... and matches Dan's cycle 1 value for fp= -0.27936*/
 /*now wrap it in the 15 cycle iteration for final theta*/
      do krep = 1 to 15;
       tp=(ta+tb)/2;
       fpd=0 ;
       do i = 1 to nitems;
       expval=exp(a(i)*1.7*(tp-b(i))); /*note in second call, theta=tp*/
             fpd = fpd + a(i)*1.7*(-1. + 1./(1. + expval) + u(i) -
(c(i)*u(i))/(c(i) + expval));
       end;
       fp = fpd + (mu - tp)/s**2 ; /*note in second call, theta=tp*/
       if fp = 0 then stop ;
       else if fa*fp > 0 then
       do;
             ta=tp; fa=fp;
             end;
       else tb=tp;
       end;
       PC_theta=(ta+tb)/2;
 keep ssn PC_theta ;
run;

data ScoreMK;
 set WithParm (keep=SSN MKa1-MKa25 MKb1-MKb25 MKc1-MKc25 CMK01-CMK25
MKitems);
 nitems=25;
 /*initialize constants*/
 ta=-4; tb=4; fpd=0; mu=0; s=1;
```

```
 /*set arrays*/
 array a(25) MKa1-MKa25;
 array b(25) MKb1-MKb25;
 array c(25) MKc1-MKc25;
 array u(25) CMK01-CMK25;
 /*now get initial estimate of fa on the first pass through the data*/
       do i = 1 to nitems;
       expval=exp(a(i)*1.7*(ta-b(i))); /*note in first call, theta=ta*/
             fpd = fpd + a(i)*1.7*(-1. + 1./(1. + expval) + u(i) -
(c(i)*u(i))/(c(i) + expval));
       end;
       fa = fpd + (mu - ta)/s**2 ; /*note in first call, theta=ta*/
 /*first part worked... and matches Dan's cycle 0 value for fa=4.30928*/
 /*now get initial estimate of fp on the second pass through the data*/
 /*second part worked... and matches Dan's cycle 1 value for fp= -0.27936*/
 /*now wrap it in the 15 cycle iteration for final theta*/
      do krep = 1 to 15;
       tp=(ta+tb)/2;
       fpd=0 ;
       do i = 1 to nitems;
       expval=exp(a(i)*1.7*(tp-b(i))); /*note in second call, theta=tp*/
             fpd = fpd + a(i)*1.7*(-1. + 1./(1. + expval) + u(i) -
(c(i)*u(i))/(c(i) + expval));
       end;
       fp = fpd + (mu - tp)/s**2 ; /*note in second call, theta=tp*/
       if fp = 0 then stop ;
       else if fa*fp > 0 then
       do;
             ta=tp; fa=fp;
             end;
       else tb=tp;
       end;
       MK_theta=(ta+tb)/2;
 keep ssn MK_theta ;
run;

data ScoreEI;
 set WithParm (keep=SSN EIa1-EIa20 EIb1-EIb20 EIc1-EIc20 CEI01-CEI20
EIitems);
 nitems=20;
 /*initialize constants*/
 ta=-4; tb=4; fpd=0; mu=0; s=1;
 /*set arrays*/
 array a(20) EIa1-EIa20;
 array b(20) EIb1-EIb20;
 array c(20) EIc1-EIc20;
 array u(20) CEI01-CEI20;
 /*now get initial estimate of fa on the first pass through the data*/
       do i = 1 to nitems;
       expval=exp(a(i)*1.7*(ta-b(i))); /*note in first call, theta=ta*/
             fpd = fpd + a(i)*1.7*(-1. + 1./(1. + expval) + u(i) -
(c(i)*u(i))/(c(i) + expval));
       end;
       fa = fpd + (mu - ta)/s**2 ; /*note in first call, theta=ta*/
 /*first part worked... and matches Dan's cycle 0 value for fa=4.30928*/
 /*now get initial estimate of fp on the second pass through the data*/
 /*second part worked... and matches Dan's cycle 1 value for fp= -0.27936*/
```

```
 /*now wrap it in the 15 cycle iteration for final theta*/
      do krep = 1 to 15;
       tp=(ta+tb)/2;
       fpd=0 ;
       do i = 1 to nitems;
       expval=exp(a(i)*1.7*(tp-b(i))); /*note in second call, theta=tp*/
             fpd = fpd + a(i)*1.7*(-1. + 1./(1. + expval) + u(i) -
(c(i)*u(i))/(c(i) + expval));
       end;
       fp = fpd + (mu - tp)/s**2 ; /*note in second call, theta=tp*/
       if fp = 0 then stop ;
       else if fa*fp > 0 then
       do;
             ta=tp; fa=fp;
             end;
       else tb=tp;
       end;
       EI_theta=(ta+tb)/2;
 keep ssn EI_theta ;
run;

data ScoreAS;
 set WithParm (keep=SSN ASa1-ASa25 ASb1-ASb25 ASc1-ASc25 CAS01-CAS25
ASitems);
 nitems=25;
 /*initialize constants*/
 ta=-4; tb=4; fpd=0; mu=0; s=1;
 /*set arrays*/
 array a(25) ASa1-ASa25;
 array b(25) ASb1-ASb25;
 array c(25) ASc1-ASc25;
 array u(25) CAS01-CAS25;
 /*now get initial estimate of fa on the first pass through the data*/
       do i = 1 to nitems;
       expval=exp(a(i)*1.7*(ta-b(i))); /*note in first call, theta=ta*/
             fpd = fpd + a(i)*1.7*(-1. + 1./(1. + expval) + u(i) -
(c(i)*u(i))/(c(i) + expval));
       end;
       fa = fpd + (mu - ta)/s**2 ; /*note in first call, theta=ta*/
 /*first part worked... and matches Dan's cycle 0 value for fa=4.30928*/
 /*now get initial estimate of fp on the second pass through the data*/
 /*second part worked... and matches Dan's cycle 1 value for fp= -0.27936*/
 /*now wrap it in the 15 cycle iteration for final theta*/
      do krep = 1 to 15;
       tp=(ta+tb)/2;
       fpd=0 ;
       do i = 1 to nitems;
       expval=exp(a(i)*1.7*(tp-b(i))); /*note in second call, theta=tp*/
             fpd = fpd + a(i)*1.7*(-1. + 1./(1. + expval) + u(i) -
(c(i)*u(i))/(c(i) + expval));
       end;
       fp = fpd + (mu - tp)/s**2 ; /*note in second call, theta=tp*/
       if fp = 0 then stop ;
       else if fa*fp > 0 then
       do;
             ta=tp; fa=fp;
             end;
```

```
       else tb=tp;
       end;
       AS_theta=(ta+tb)/2;
 keep ssn AS_theta ;
run;

data ScoreMC;
 set WithParm (keep=SSN MCa1-MCa25 MCb1-MCb25 MCc1-MCc25 CMC01-CMC25
MCitems);
 nitems=25;
 /*initialize constants*/
 ta=-4; tb=4; fpd=0; mu=0; s=1;
 /*set arrays*/
 array a(25) MCa1-MCa25;
 array b(25) MCb1-MCb25;
 array c(25) MCc1-MCc25;
 array u(25) CMC01-CMC25;
 /*now get initial estimate of fa on the first pass through the data*/
       do i = 1 to nitems;
       expval=exp(a(i)*1.7*(ta-b(i))); /*note in first call, theta=ta*/
             fpd = fpd + a(i)*1.7*(-1. + 1./(1. + expval) + u(i) -
(c(i)*u(i))/(c(i) + expval));
       end;
       fa = fpd + (mu - ta)/s**2 ; /*note in first call, theta=ta*/
 /*first part worked... and matches Dan's cycle 0 value for fa=4.30928*/
 /*now get initial estimate of fp on the second pass through the data*/
 /*second part worked... and matches Dan's cycle 1 value for fp= -0.27936*/
 /*now wrap it in the 15 cycle iteration for final theta*/
      do krep = 1 to 15;
       tp=(ta+tb)/2;
       fpd=0 ;
       do i = 1 to nitems;
       expval=exp(a(i)*1.7*(tp-b(i))); /*note in second call, theta=tp*/
             fpd = fpd + a(i)*1.7*(-1. + 1./(1. + expval) + u(i) -
(c(i)*u(i))/(c(i) + expval));
       end;
       fp = fpd + (mu - tp)/s**2 ; /*note in second call, theta=tp*/
       if fp = 0 then stop ;
       else if fa*fp > 0 then
       do;
             ta=tp; fa=fp;
             end;
       else tb=tp;
       end;
       MC_theta=(ta+tb)/2;
 keep ssn MC_theta ;
run;

data ScoreAO;
 set WithParm (keep=SSN AOa1-AOa25 AOb1-AOb25 AOc1-AOc25 CAO01-CAO25
AOitems);
 nitems=25;
 /*initialize constants*/
 ta=-4; tb=4; fpd=0; mu=0; s=1;
 /*set arrays*/
 array a(25) AOa1-AOa25;
 array b(25) AOb1-AOb25;
```

```
 array c(25) AOc1-AOc25;
 array u(25) CAO01-CAO25;
 /*now get initial estimate of fa on the first pass through the data*/
       do i = 1 to nitems;
       expval=exp(a(i)*1.7*(ta-b(i))); /*note in first call, theta=ta*/
             fpd = fpd + a(i)*1.7*(-1. + 1./(1. + expval) + u(i) -
(c(i)*u(i))/(c(i) + expval));
       end;
       fa = fpd + (mu - ta)/s**2 ; /*note in first call, theta=ta*/
 /*first part worked... and matches Dan's cycle 0 value for fa=4.30928*/
 /*now get initial estimate of fp on the second pass through the data*/
 /*second part worked... and matches Dan's cycle 1 value for fp= -0.27936*/
 /*now wrap it in the 15 cycle iteration for final theta*/
      do krep = 1 to 15;
       tp=(ta+tb)/2;
       fpd=0 ;
       do i = 1 to nitems;
       expval=exp(a(i)*1.7*(tp-b(i))); /*note in second call, theta=tp*/
             fpd = fpd + a(i)*1.7*(-1. + 1./(1. + expval) + u(i) -
(c(i)*u(i))/(c(i) + expval));
       end;
       fp = fpd + (mu - tp)/s**2 ; /*note in second call, theta=tp*/
       if fp = 0 then stop ;
       else if fa*fp > 0 then
       do;
             ta=tp; fa=fp;
             end;
       else tb=tp;
       end;
       AO_theta=(ta+tb)/2;
 keep ssn AO_theta ;
run;/*Merge the 9 subtest theta estimates by ID into a single file*/
data afct.theta;
 merge ScoreGS ScoreAR ScoreWK ScorePC ScoreMK ScoreEI ScoreAS ScoreMC
ScoreAO;
 by SSN;
 /*this creates the standand scores from EITHER version and is the */
 /*method from Dan's PDF doc, chapter 4 plus data in tables 2.1, 2.2*/
 /*this was tested against Dan's two subject example. */
 GSs = round(47.151224 + 10.527430 * GS_theta, 1);
 ARs = round(47.667251 + 9.433283 * AR_theta, 1);
 WKs = round(46.644903 + 10.243609 * WK_theta, 1);
 PCs = round(49.317406 + 10.097481 * PC_theta, 1);
 MKs = round(47.936105 + 9.314591 * MK_theta, 1);
 EIs = round(47.865784 + 11.838647 * EI_theta, 1);
 ASs = round(47.914860 + 12.381293 * AS_theta, 1);
 MCs = round(48.943491 + 10.677225 * MC_theta, 1);
 AOs = round(50.649606 + 10.393213 * AO_theta, 1);
 VEs = round(47.481779 + 6.861654*WK_theta + 4.091172*PC_theta, 1);
 run;
proc print data=afct.theta; run;
/*************************************************************************
*/
/*this does a table lookup for the AFQT, based on Dan's 1997 norm
publication*/
/*it works for any test version where the standard scores are on the */
/*1997 score scale. Uses temp arrays with the look up values. */
```

```
/*************************************************************************
*/
data afct.theta_afqt;
 set afct.theta ;
 array sums(161) _temporary_
 (109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123,
124, 125,
 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140,
141, 142,
 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157,
158, 159,
 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174,
175, 176,
 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191,
192, 193,
 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208,
209, 210,
 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225,
226, 227,
 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242,
243, 244,
 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259,
260, 261,
 262, 263, 264, 265, 266, 267, 268, 269) ;
 array afqts(161) _temporary_
 (1, 2, 2, 2, 2, 2, 2, 2, 2, 2, 3, 3, 3, 3, 3, 3, 4, 4, 4, 4, 4, 4, 4, 4, 4,
5, 5, 5, 5, 6, 6, 6, 6, 7, 7,
 7, 7, 8, 8, 9, 9, 9, 9, 10, 10, 11, 11, 11, 12, 13, 13, 14, 15, 15, 16, 16,
17, 17, 18, 19, 19, 20, 21, 22,
 22, 23, 24, 25, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 35, 36, 38, 39,
40, 41, 42, 43, 44, 45,
 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 59, 60, 61, 62, 63, 64, 66,
67, 68, 69, 70, 70, 71,
 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 82, 83, 84, 85, 85, 86, 87, 88,
88, 89, 90, 90, 91, 92,
 92, 93, 93, 93, 94, 94, 95, 95, 95, 96, 96, 96, 97, 97, 97, 97, 98, 98, 98,
98, 98, 99) ;
 length sum afqt 3.0;
 sum=ARs+MKs+2*VEs; /*sum the standard scores...*/
 afqt=0;
 if sum<=109 then afqt=1;
 if sum>=269 then afqt=99;
 do i=1 to 161 until (afqt>0);
 if sum=sums(i) then afqt=afqts(i);
 end;
run;
proc print data=afct.theta_afqt ; run;
```

# Appendix E:
# Web AFCT Equating Study

# Web-AFCT Equating Study

Zannette Uriell

NPRST
research at work

## Problem – Old Technology

- A computer-based version of the Armed Services Vocational Aptitude Battery (ASVAB) is administered to Sailors when they join the Navy
- To improve ASVAB scores while in-service (possibly to qualify for a different rating), they receive a paper-based version of the Armed Forces Classification Test (AFCT; in-service version of the ASVAB)
- As Navy moves more training and testing to the Internet, they would like to move AFCT administration to the Internet as well
  - Less time-consuming for examinees as well as administrators
  - Increased security of the test items

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## Problem – Inaccurate Scoring and Recording

- AFCT currently does not use item response theory so cannot be scored using 1997 scale scores
- Scores are hand-entered into personnel files, increasing the potential for errors

- Does creating a web-based AFCT impact results, even though more secure and accurate?

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## Objective

- Create a web-based version of AFCT Form 19G
- Conduct platform-effects study
  - Test one group of Sailors with the paper-based Form 19G while testing a matched group using the web-based version
    - » Match on gender and majority/minority status
- Determine if there are any differences in scores overall as well as by gender and majority/minority subgroups

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# AFCT Description

- AFCT is the version of the ASVAB administered while in the service
- Test consists of 9 sections:

| | Subject | Number of Questions | Time Limit |
|---|---|---|---|
| 1 | General Science (GS) | 25 | 11 |
| 2 | Arithmetic Reasoning (AR) | 30 | 36 |
| 3 | Word Knowledge (WK) | 35 | 11 |
| 4 | Paragraph Comprehension (PC) | 15 | 13 |
| 5 | Mathematics Knowledge (MK) | 25 | 24 |
| 6 | Electronics Information (EI) | 20 | 9 |
| 7 | Automotive and Shop (AS) | 25 | 11 |
| 8 | Mechanical Comprehension (MC) | 25 | 19 |
| 9 | Assembling Objects (AO) | 25 | 15 |

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## Subjects

- Testing conducted 31 July – 13 September 2006
- Personnel assigned to NTC Great Lakes during testing may have participated
  - Majority were students in "A" School (tested by duty section) or in INDOC (after last indoctrination class ended)
  - Small portion were Not Under Instruction (NUI) while two were staff members (E-6)
- Demographic information (gender and majority/minority status) collected through sign-in sheets

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## Conditions

- Majority of subjects were assigned to the two conditions based upon the last digit of SSN
  - Those with even last digits received paper version and those with odd received web version
- Most subjects in INDOC (afternoon sessions) were assigned to the web condition until all computers were filled; remaining subjects were assigned to the paper condition
- General Form 19G instructions were adapted for experiment
  - Web-based instructions were provided as on-screen text that the subjects read

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## Paper-Based Condition

- Testing took place in either a classroom setting (individual table/chairs spaced about 2 feet apart) or in a hangar bay (large table with 2 chairs, examinees seated in every other chair)
- Standard AFCT paper administration procedures were followed throughout
- Two proctors were available to read instructions, pass out materials, and monitor the testing session
- Instructions were read to examinees about the voluntary nature of the testing as part of the standard AFCT instructions

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## Paper-Based Condition (continued)

- Each participant received a modified AFCT Privacy Act Statement indicating that scores would only count if they were better than previous ASVAB scores
- Examinees received 2 pencils, 2 pieces of scratch paper, an answer sheet, and a test book while the instructions were read
- Test administrators read instructions at the beginning of sections, including sample problem(s), number of questions, and time limit for the section

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## Paper-Based Condition (continued)

- Examinees read questions in the test book, with 4 to 10 questions per pages (depending on section)
- Responses were marked on a standard "bubble" scantron answer sheet
- Examinees were timed by test administrators
- All testing materials were collected before dismissal

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## Web-Based Condition – Similarities to Paper

- Two proctors were available to read instructions, pass out materials, and monitor testing throughout session
- Examinees were read instructions about the voluntary nature of the testing
- Each received a modified Privacy Act Statement indicating that scores would only count if they were better than previous ASVAB scores
- Each received 2 pencils and 2 pieces of scratch paper

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## Web-Based Condition – Similarities to Paper (continued)

- Section instructions prefaced each section; instructions were not timed but timing started once the first question appeared
- Within each section, the examinee could go backwards or forwards, and skip questions; subjects could not return to previously completed sections
- All testing materials were collected as each respondent finished

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## Web-Based Condition – Room Layout and Computers

- Testing took place in a classroom setting (individual table/chair)
  - Pairs of examinees faced each other with laptop screens between them
  - Each pair was about 2 feet distant from another pair
- Compaq Evo N1020v laptops with Windows XP and IE 6.x were used as testing laptops
- Up to three servers (either Windows NT or 2003) were used at a time, with, at most, 23 testing laptops connected to each
  - Win 2003 server took longer to serve up pages, but time did not count against section testing time

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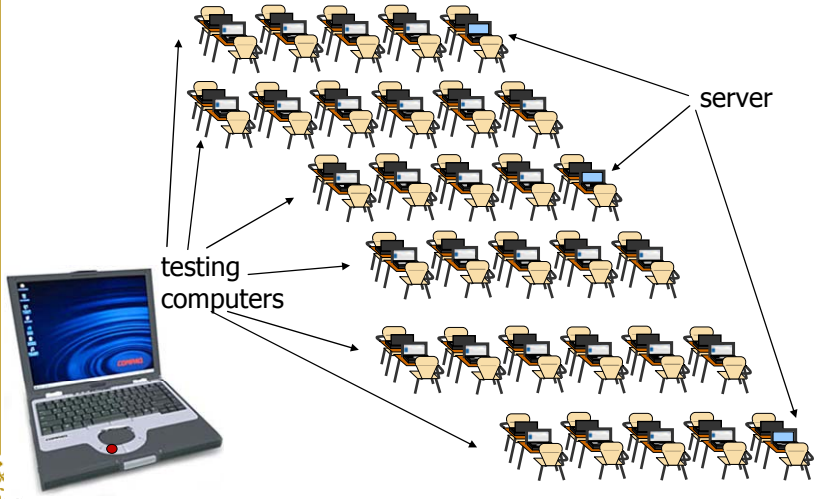
# Web-Based Condition – Room Layout

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# Web-Based Condition – Differences from Paper-Based

- While waiting to begin testing, examinees were allowed to play games on the computer to get used to the koala-pad mouse; a colored dot was included on the left mouse button for ease in identification
- Examinees were directed to follow the instructions on the computer screen
- Sample questions were provided as text to read
- Questions and answers were presented in Internet Explorer (IE), one question at a time

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## Web-Based AFCT

- Each AFCT section was programmed in WebQuiz XP
  - Test questions and data stored in .mdb files
  - Question display handled by .asp files
- Each section timed through WebQuiz
- Respondent entered SSN at beginning of first section and system automatically propagated SSN to succeeding sections
  - Respondent could not go back to previous section without restarting entire AFCT

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## Web-Based AFCT (continued)

- For PC section, the paragraph was presented along with the first question about that paragraph; succeeding questions were on separate pages and examinee could go back to the paragraph if needed
- Time remaining was shown at the bottom left of the IE window, and respondents could continue to the next AFCT section on their own (self-paced)

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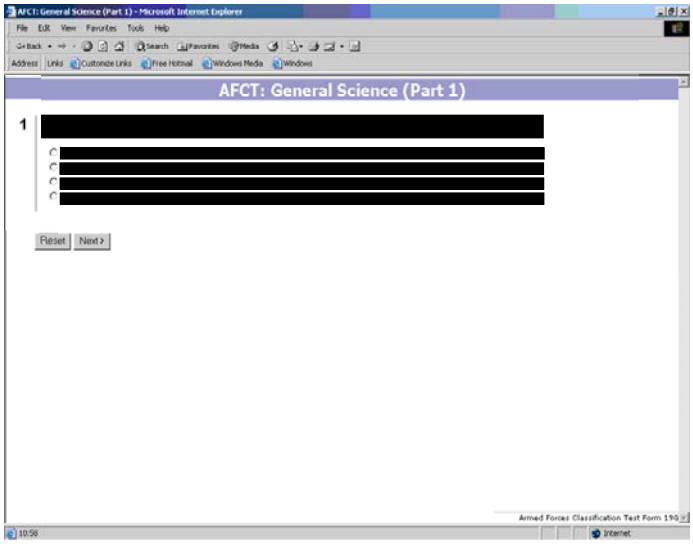
# Web-Based AFCT – Screen Layout

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# Observed Advantages of Web AFCT Administration

- The web AFCT is self-paced, so Sailors generally finished sooner than on paper
  - Paper testing requires a minimum of 2.5 hours plus time to read instructions
  - At least half of the web examinees were done within 2 hours, with a few completing in 1 hour
- Less interaction with test administrator is required (in the Fleet, this is usually another Sailor such as the Command Career Counselor)
- No need for scanning answer forms or for hand entry of data – reduces error due to incorrect entry or scanning
- Increased test question security
- Examinees definitely cannot return to previous sections
- No chance of marking two answers to one question

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## Observed Disadvantages of Web AFCT Administration

- All Windows-based computers have a calculator installed, but calculators are not allowed on AFCT
  - Calculators need to be removed from Windows program menu if not from the computer itself
- For Paragraph Comprehension section, one examinee used the IE Find function to electronically find key words in the paragraph
  - Impact of this would depend on actual questions

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## Analysis

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## Data Inclusion Rules

- Only those who completed (including SSN) and signed a Privacy Act Statement are included
- Staff members are not included
  - Two staff members took the web version of the test
- Only the first set of answers is used in analyses
  - Some took the test multiple times in the same or different format
  - Two people took the test in the same week
    - » One completed one session completely and only the first section of the second session, so the complete set of answers is used in analysis
    - » One completed both versions of the test but was not included because it was unclear which version was completed first

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## Data Inclusion Rules (continued)

- Respondents with patterns to their answers (all A, ABCD repeated, AABBCCDD repeated, etc.) are included
  - Unclear what is a "pattern" and what is a legitimate answer
  - Likely both paper and web respondents displayed this behavior
- Respondent must have completed at least half of a section to be included in analyses for that section
  - Some had to leave before completing their tests, while others chose not to answer any questions
  - List-wise deletion not recommended since some legitimately skipped questions or ran out of time on the section

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# Data Used in Analyses

- Overall data:

| | Overall | Male | Female | Majority | Minority |
|---|---|---|---|---|---|
| Paper (p) | 689 | 547 | 91 | 412 | 177 |
| Web (w) | 762 | 572 | 111 | 361 | 229 |

- Ns for each section are included on each slide

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# Data Scoring

- Test scored using item response theory[1]
  - The three parameter logistic model was used
  - Respondents received a 1 (if answered correctly) or 0 (if answered incorrectly or blank)
  - Theta score computed from parameters using bisection algorithm
- Theta scores translated to standard scores (mean 50, standard deviation 10, range 20-80) on the 1997 ASVAB normative scale

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[1] Segall, D. O. (November 2005). *Item Response Theory Scoring Algorithms for AFCT Forms 18F and 19G: 1997 Score Scale.*

# Data Scoring (continued)

- Standard score ranges vary by test

| | Subject | All wrong answers | All correct answers |
|---|---|---|---|
| 1 | General Science (GS) | 19 | 72 |
| 2 | Arithmetic Reasoning (AR) | 24 | 68 |
| 3 | Word Knowledge (WK) | 15 | 66 |
| 4 | Paragraph Comprehension (PC) | 25 | 62 |
| 5 | Mathematics Knowledge (MK) | 27 | 67 |
| 6 | Electronics Information (EI) | 23 | 80 |
| 7 | Automotive and Shop (AS) | 23 | 76 |
| 8 | Mechanical Comprehension (MC) | 28 | 75 |
| 9 | Assembling Objects (AO) | 27 | 66 |
| | Verbal (VE) (Composite of PC and WK) | 16 | 66 |

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# Linear Equating

- Sponsor requested an equating study
  - Linear equating chosen because of the relatively small number of cases
- Based upon means (μ) and standard deviation (σ) of paper and web tests, lines were computed to convert between the two versions:

$$p=(\sigma_p/\sigma_w)*w+(\mu_p-((\sigma_p/\sigma_w)*\mu_w))$$

$$w=(\sigma_w/\sigma_p)*p+(\mu_w-((\sigma_w/\sigma_p)*\mu_p))$$

where p = paper and w = web

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# Linear Equating Graphs

- Using the formulae, equivalent scores were calculated for all possible scores between 20 and 80
- Scores were graphed as two lines
  - Red line shows the paper score for a given web score
  - Blue line shows the web score for a given paper score
- Lines that are closer together, especially at the scale mean of 50, indicate that scores from the paper and web tests are similar

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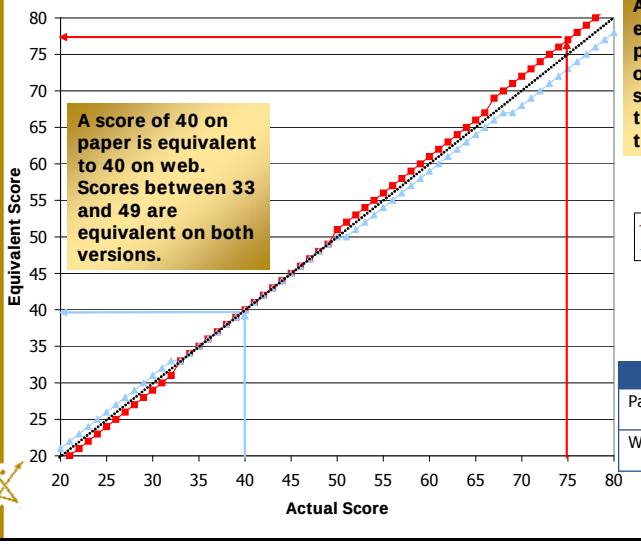
# General Science (GS)




| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 664 | 53.98 | 8.025 |
| Web (w) | 741 | 53.27 | 7.581 |

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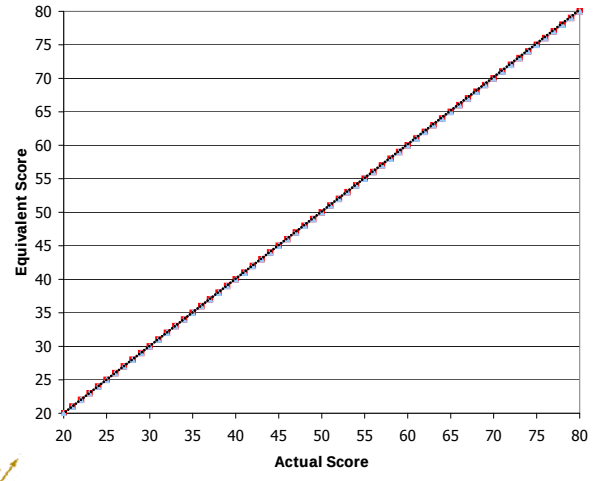
# Arithmetic Reasoning (AR)




| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 660 | 51.77 | 7.741 |
| Web (w) | 739 | 51.81 | 7.640 |

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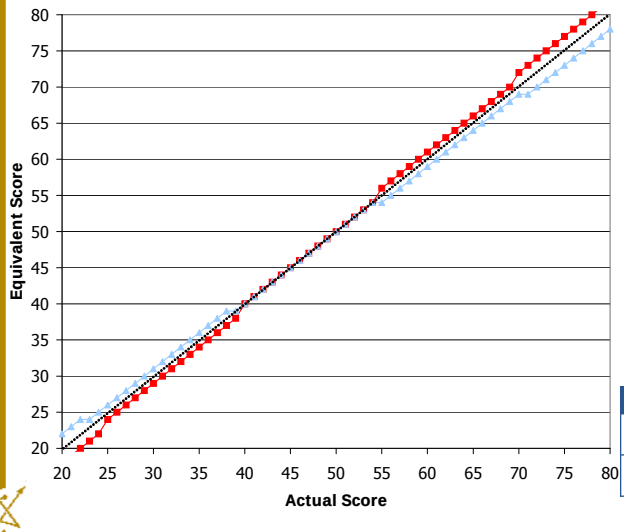
# Word Knowledge (WK)




| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 650 | 53.78 | 7.613 |
| Web (w) | 741 | 53.35 | 7.141 |

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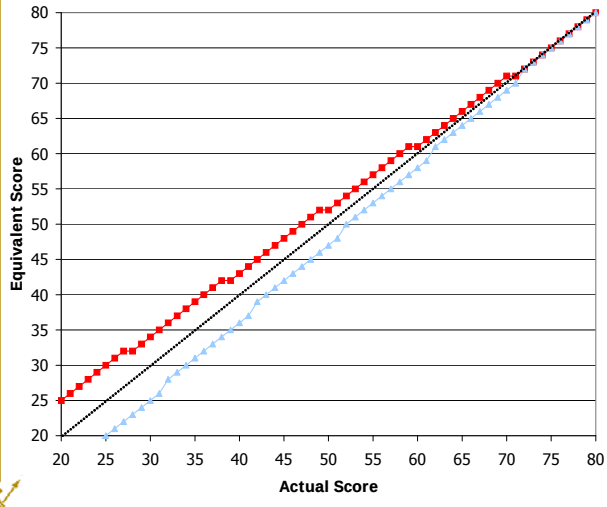
# Paragraph Comprehension (PC)




**PC scores tend to differ at the low end of the scale, with paper scores higher than web scores.**

| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 647 | 53.13 | 7.004 |
| Web (w) * | 740 | 50.79 | 7.709 |

* Significant difference between paper and web ($t$=5.884, $p$=.00).

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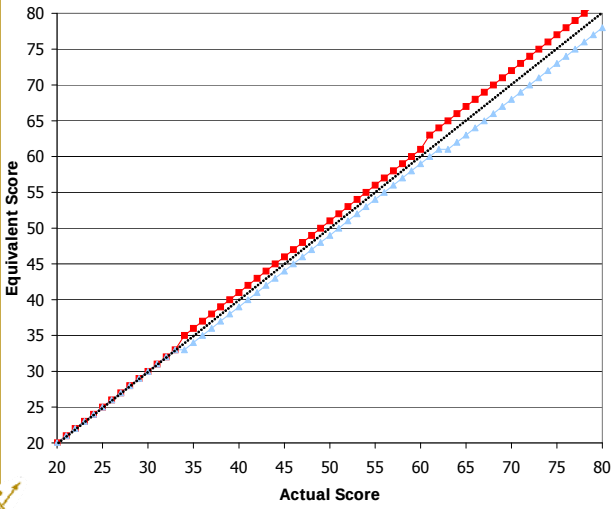
# Verbal (VE)




**VE scores are based on WK and PC scores.**

| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 646 | 53.82 | 7.270 |
| Web (w) * | 739 | 52.61 | 7.013 |

* Significant difference between paper and web ($t$=3.149, $p$=.00).

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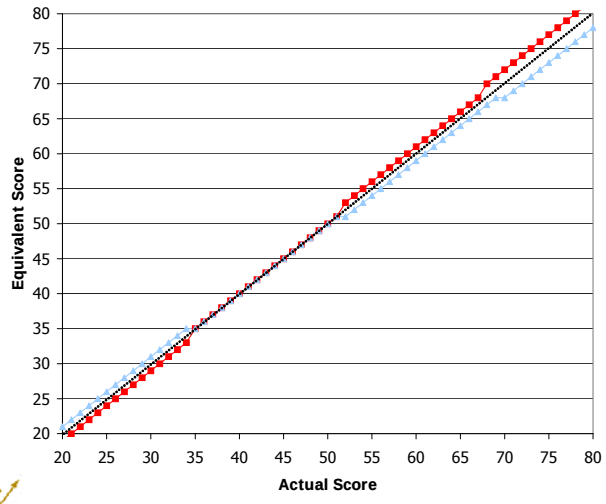
# Mathematics Knowledge (MK)




| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 648 | 53.69 | 7.051 |
| Web (w) | 739 | 53.09 | 6.652 |

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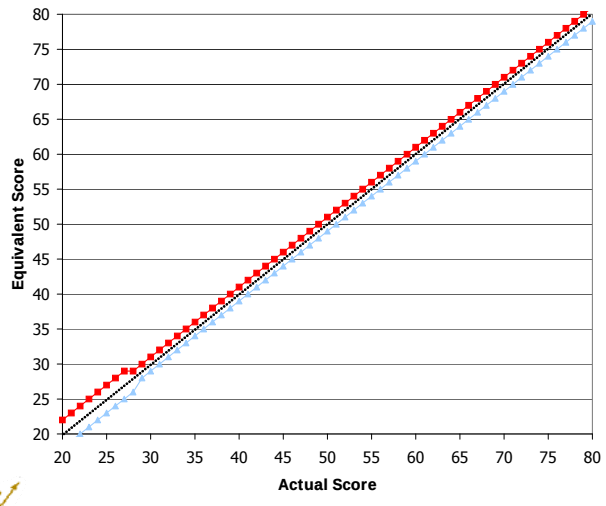
# Electronics Information (EI)




| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 647 | 57.79 | 11.675 |
| Web (w) | 735 | 56.70 | 11.839 |

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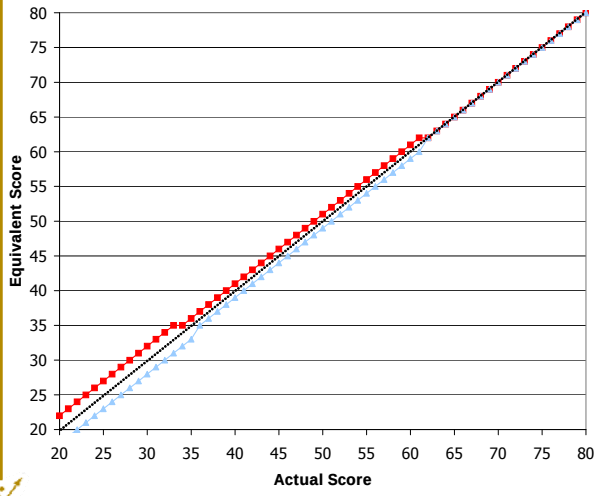
# Automotive and Shop (AS)




| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 646 | 51.61 | 9.854 |
| Web (w) | 731 | 50.73 | 10.227 |

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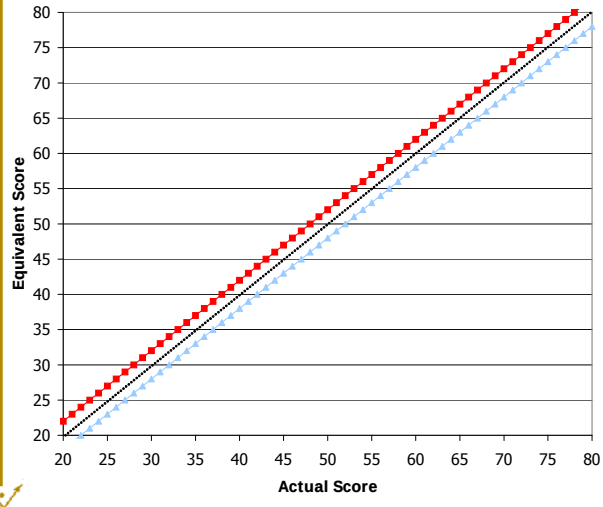
# Mechanical Comprehension (MC)




**Consistent difference between paper and web for MC, with paper being higher.**

| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 646 | 57.34 | 8.932 |
| Web (w) * | 726 | 55.32 | 8.824 |

* Significant difference between paper and web ($t$=4.208, $p$=.00).

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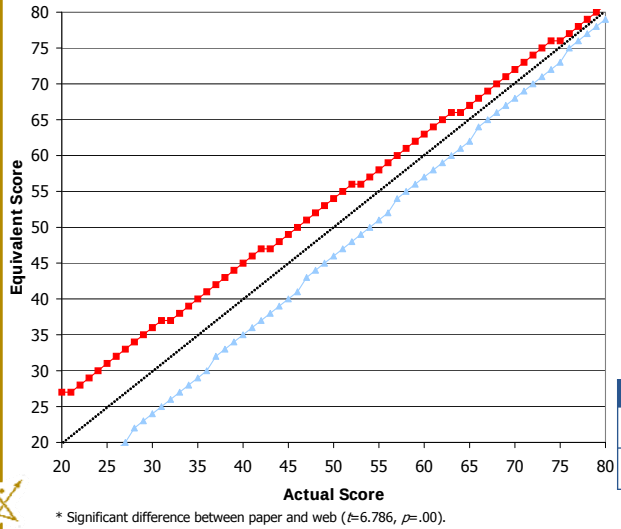
# Assembling Objects (AO)




**Large difference between AO scores at the low end of the scale.**

| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 644 | 55.10 | 9.320 |
| Web (w) * | 721 | 51.48 | 10.281 |

* Significant difference between paper and web ($t$=6.786, $p$=.00).

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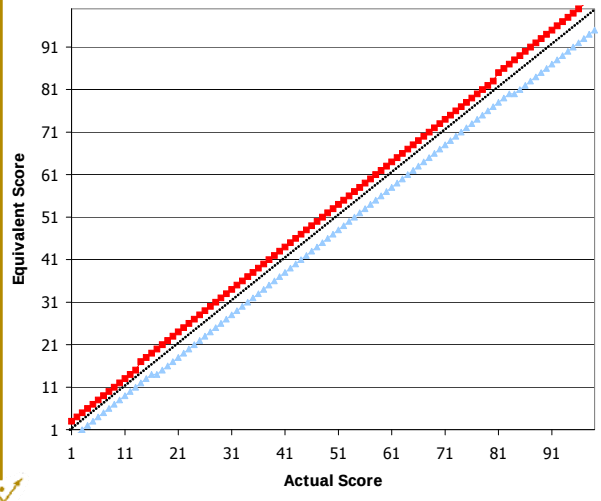
# Armed Forces Qualification Test (AFQT)




**Armed Forces Qualification Test (AFQT) is AR+MK+2VE; scores range from 1 to 99.**

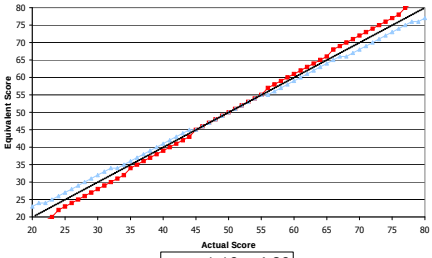
| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 646 | 61.72 | 22.019 |
| Web (w) * | 734 | 58.54 | 21.693 |

* Significant difference between paper and web ($t$=2.695, $p$=.01).

40

# General Science (GS) by Gender

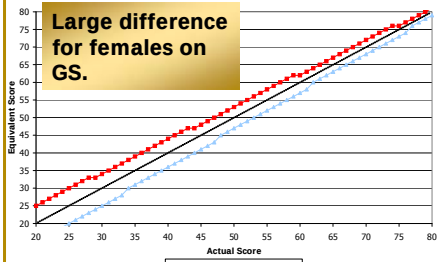
## Male




| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 525 | 54.62 | 8.010 |
| Web (w) | 552 | 54.22 | 7.309 |

## Female

**Large difference for females on GS.**



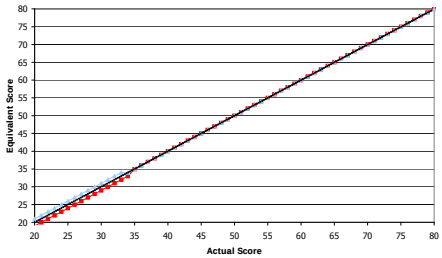

| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 90 | 53.03 | 7.257 |
| Web (w) * | 111 | 49.92 | 7.760 |

* Significant difference between paper and web for females ($t$=2.908, $p$=.00).

41

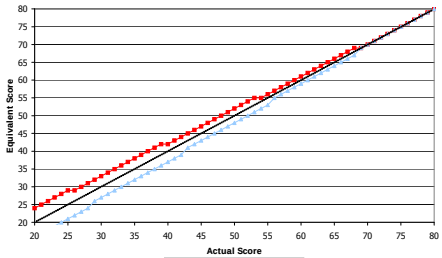
# Arithmetic Reasoning (AR) by Gender

## Male




| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 521 | 52.20 | 7.788 |
| Web (w) | 549 | 52.37 | 7.650 |

## Female



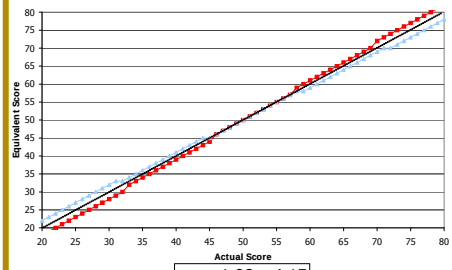

| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 90 | 51.67 | 6.722 |
| Web (w) | 111 | 49.88 | 7.230 |

42

# Word Knowledge (WK) by Gender

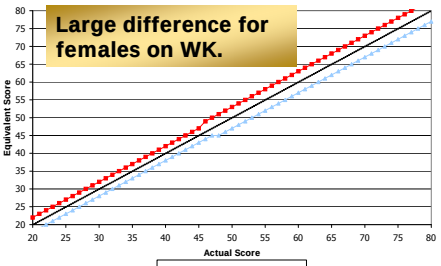
NPRST

## Male




| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 515 | 54.08 | 7.784 |
| Web (w) | 551 | 53.88 | 7.202 |

## Female




**Large difference for females on WK.**

| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 87 | 53.94 | 6.900 |
| Web (w) * | 111 | 51.32 | 6.762 |

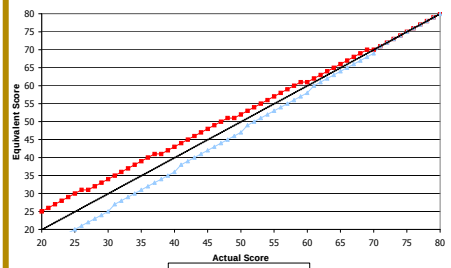
* Significant difference between paper and web for females ($t$=2.682, $p$=.01).

43

# Paragraph Comprehension (PC) by Gender

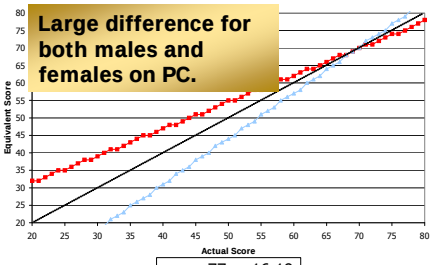
NPRST

## Male




| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 511 | 53.30 | 7.027 |
| Web (w) * | 551 | 51.07 | 7.736 |

## Female




**Large difference for both males and females on PC.**

| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 88 | 54.53 | 5.628 |
| Web (w) * | 110 | 50.03 | 7.343 |

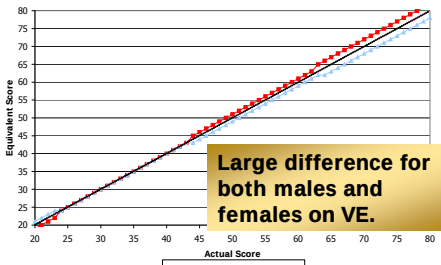
* Significant difference between paper and web for males ($t$=4.905, $p$=.00) and females ($t$=4.741, $p$=.00).

44

# Verbal (VE) by Gender

NPRST

## Male

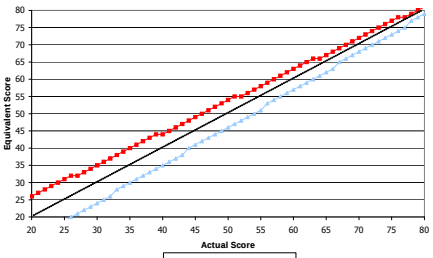



**Large difference for both males and females on VE.**

p=1.05w-1.73
w=.95p+1.64

| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 511 | 54.08 | 7.399 |
| Web (w) * | 550 | 53.06 | 7.035 |

## Female




p=.92w+7.66
w=1.09p-8.34

| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 87 | 54.52 | 6.344 |
| Web (w) * | 110 | 50.97 | 6.902 |

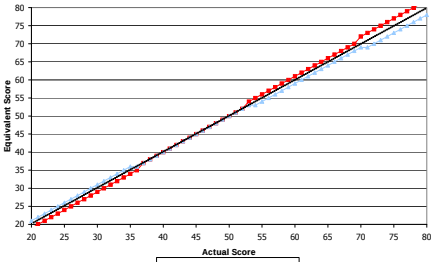
* Significant difference between paper and web for males ($t$=2.302, $p$=.02) and females ($t$=3.714, $p$=.00).

45

# Mathematics Knowledge (MK) by Gender

NPRST

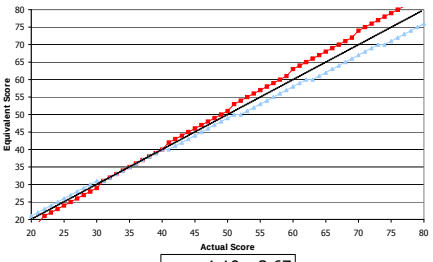
## Male




p=1.06w-2.70
w=.94p+2.55

| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 512 | 54.05 | 7.101 |
| Web (w) | 549 | 53.50 | 6.695 |

## Female




p=1.10w-3.67
w=.91p+3.32

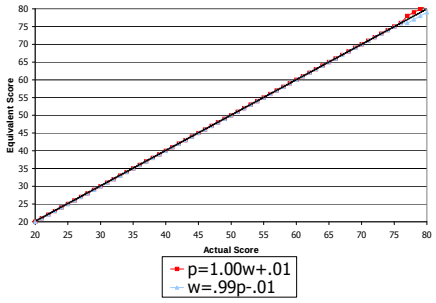
| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 88 | 53.61 | 6.510 |
| Web (w) | 111 | 51.94 | 5.903 |

46

# Electronics Information (EI) by Gender

NPRST

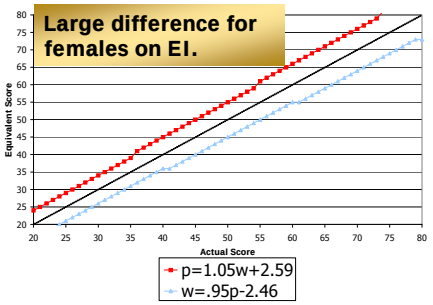
## Male




| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 511 | 59.22 | 11.709 |
| Web (w) | 545 | 58.83 | 11.634 |

## Female

**Large difference for females on EI.**




| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 88 | 52.90 | 9.047 |
| Web (w) * | 111 | 47.77 | 8.590 |

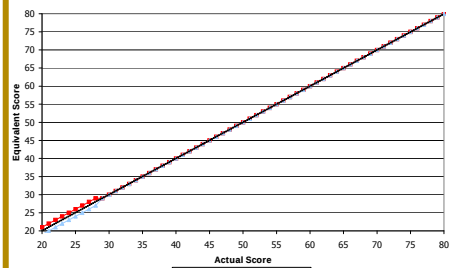
* Significant difference between paper and web for females ($t$=4.087, $p$=.00).

47

# Automotive and Shop (AS) by Gender

NPRST

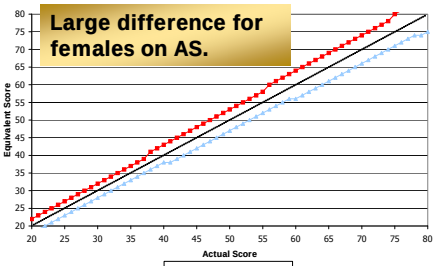
## Male




| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 510 | 53.01 | 9.803 |
| Web (w) | 543 | 52.73 | 9.890 |

## Female

**Large difference for females on AS.**




| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 88 | 44.94 | 6.464 |
| Web (w) * | 110 | 42.19 | 6.128 |

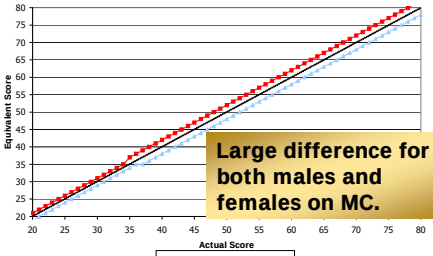
* Significant difference between paper and web for females ($t$=3.062, $p$=.00).

48

# Mechanical Comprehension (MC) by Gender

NPRST

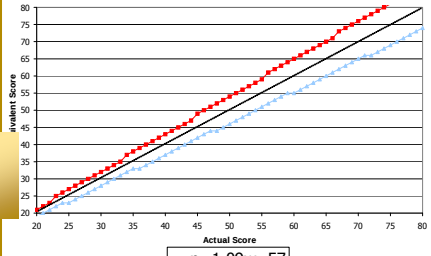
Male




Large difference for both males and females on MC.

| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 510 | 58.28 | 8.912 |
| Web (w) * | 539 | 56.47 | 8.786 |

Female




| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 88 | 53.98 | 7.680 |
| Web (w) * | 109 | 49.95 | 7.033 |

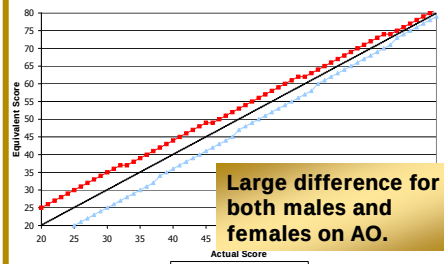
* Significant difference between paper and web for males ($t$=3.312, $p$=.00) and females ($t$=3.837, $p$=.00).

49

# Assembling Objects (AO) by Gender

NPRST

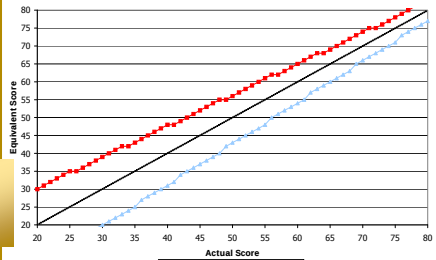
Male




Large difference for both males and females on AO.

| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 510 | 55.05 | 9.529 |
| Web (w) * | 534 | 52.02 | 10.310 |

Female




| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 87 | 56.29 | 8.215 |
| Web (w) * | 109 | 49.97 | 9.448 |

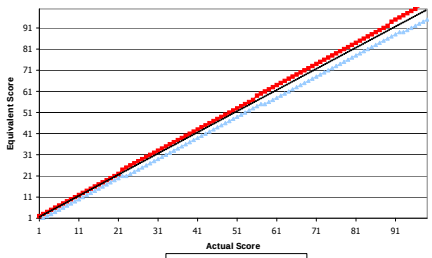
* Significant difference between paper and web for males ($t$=4.925, $p$=.00) and females ($t$=4.927, $p$=.00).

50

# Armed Forces Qualification Test (AFQT) by Gender

NPRST

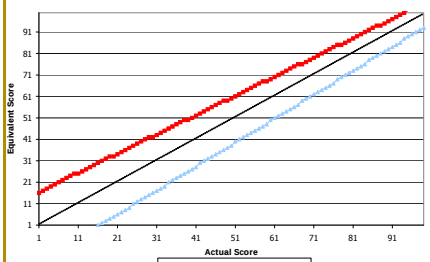
## Male




p=1.03w+.88
w=.97p-.85

| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 511 | 63.06 | 21.972 |
| Web (w) * | 545 | 60.40 | 21.343 |

## Female




p=.90w+15.54
w=1.12p-17.34

| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 87 | 62.62 | 19.524 |
| Web (w) * | 110 | 52.54 | 21.787 |

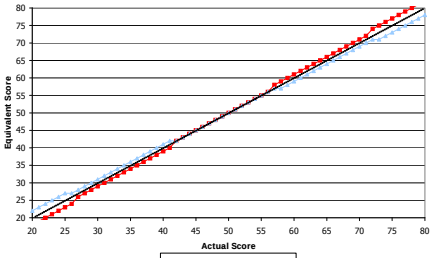
* Significant difference between paper and web for males ($t$=1.993, $p$=.05) and females ($t$=3.376, $p$=.00).

51

# General Science (GS) by Ethnicity

NPRST

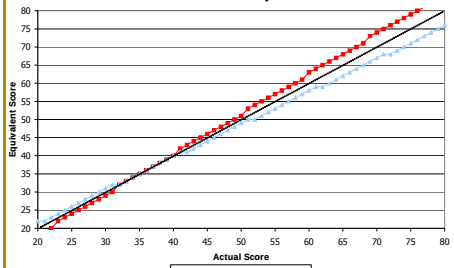
## Majority




p=1.07w-3.29
w=.94p+3.09

| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 399 | 55.66 | 7.469 |
| Web (w) | 353 | 55.24 | 6.999 |

## Minority




p=1.11w-3.93
w=.90p+3.55

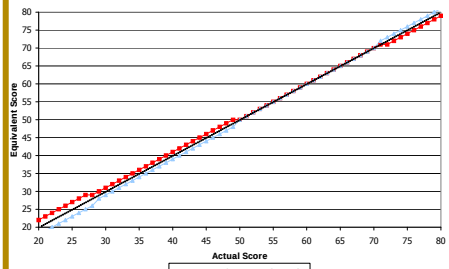
| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 166 | 52.06 | 8.227 |
| Web (w) | 219 | 50.51 | 7.421 |

52

# Arithmetic Reasoning (AR) by Ethnicity

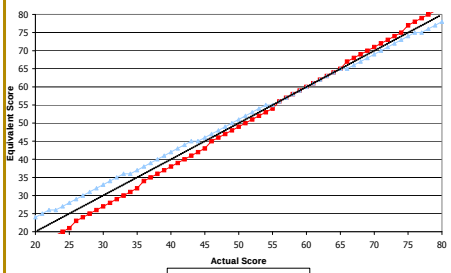
NPRST

## Majority




| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 398 | 52.95 | 7.420 |
| Web (w) | 351 | 52.61 | 7.776 |

## Minority



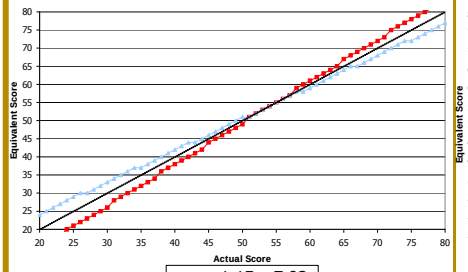

| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 163 | 50.18 | 8.221 |
| Web (w) | 218 | 51.10 | 7.461 |

53

# Word Knowledge (WK) by Ethnicity

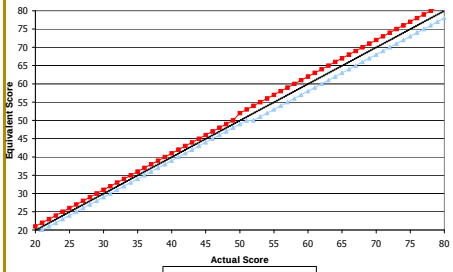
NPRST

## Majority




| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 394 | 55.15 | 7.289 |
| Web (w) | 352 | 55.06 | 6.362 |

## Minority



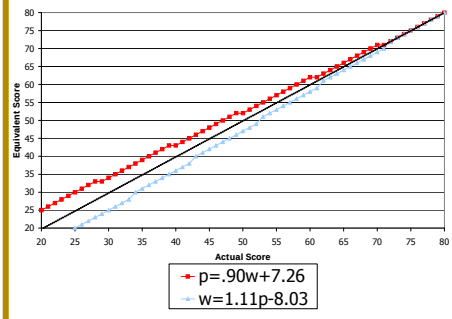

| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 159 | 52.01 | 8.183 |
| Web (w) | 219 | 50.49 | 7.940 |

54

# Paragraph Comprehension (PC) by Ethnicity

NPRST

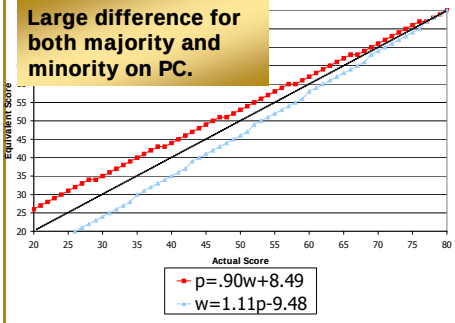
## Majority




| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 391 | 54.04 | 6.817 |
| Web (w) * | 352 | 51.74 | 7.539 |

## Minority

**Large difference for both majority and minority on PC.**




| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 158 | 52.39 | 7.127 |
| Web (w) * | 218 | 49.04 | 7.960 |

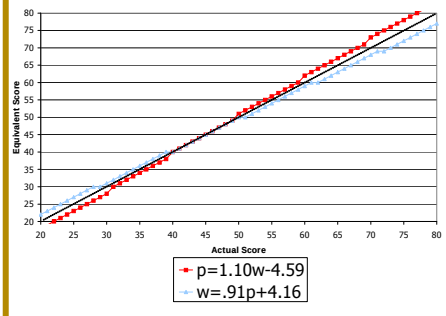
* Significant difference between paper and web for majority ($t$=4.367, $p$=.00) and minority ($t$=4.207, $p$=.00).

55

# Verbal (VE) by Ethnicity

NPRST

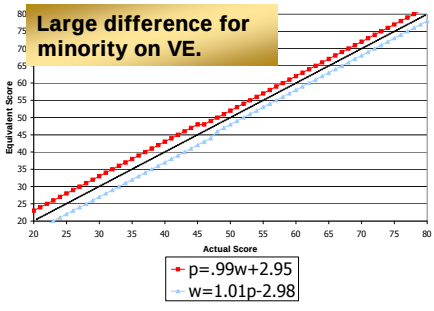
## Majority




| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 391 | 55.07 | 7.039 |
| Web (w) | 352 | 54.13 | 6.386 |

## Minority

**Large difference for minority on VE.**




| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 158 | 52.39 | 7.605 |
| Web (w) * | 218 | 49.93 | 7.682 |

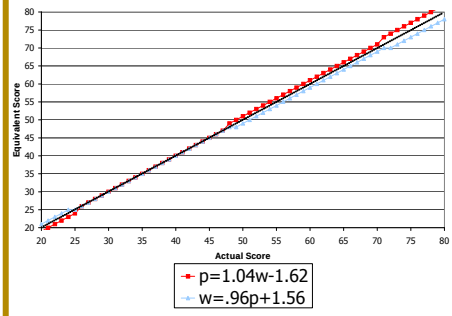
* Significant difference between paper and web for minority ($t$=3.078, $p$=.00).

56

# Mathematics Knowledge (MK) by Ethnicity

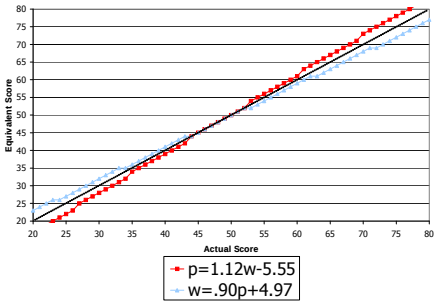
NPRST

## Majority




| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 392 | 54.60 | 7.003 |
| Web (w) | 350 | 53.83 | 6.705 |

## Minority



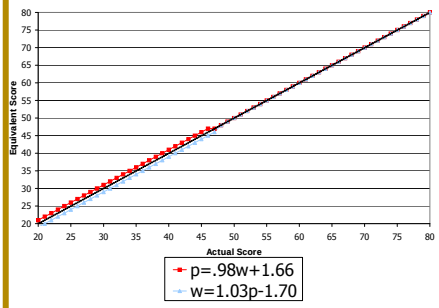

| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 158 | 52.50 | 7.173 |
| Web (w) | 219 | 52.02 | 6.427 |

57

# Electronics Information (EI) by Ethnicity

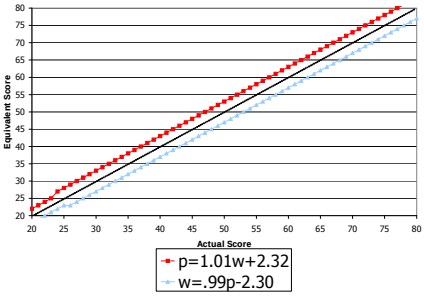
NPRST

## Majority




| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 391 | 59.71 | 11.311 |
| Web (w) | 347 | 59.53 | 11.600 |

## Minority




| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 158 | 55.33 | 11.601 |
| Web (w) * | 218 | 52.61 | 11.513 |

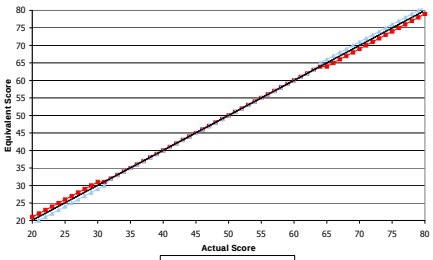
* Significant difference between paper and web for minority ($t$=2.254, $p$=.03).

58

# Automotive and Shop (AS) by Ethnicity

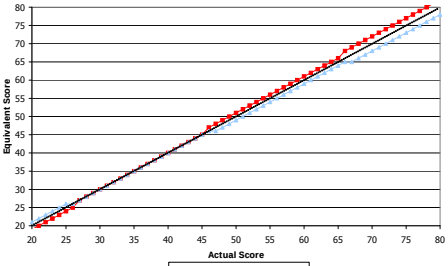
NPRST

## Majority




| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 390 | 53.95 | 9.401 |
| Web (w) | 346 | 54.15 | 9.692 |

## Minority



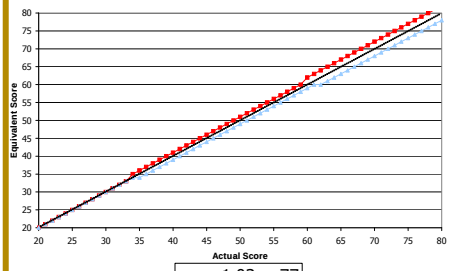

| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 158 | 46.68 | 9.216 |
| Web (w) | 217 | 46.16 | 8.769 |

59

# Mechanical Comprehension (MC) by Ethnicity

NPRST

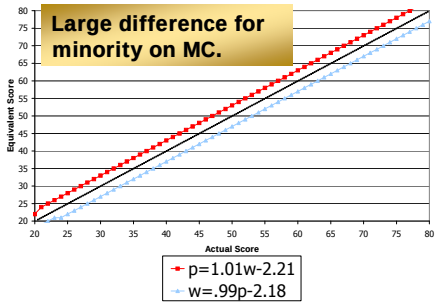
## Majority




| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 390 | 58.92 | 8.725 |
| Web (w) | 345 | 57.51 | 8.405 |

## Minority

**Large difference for minority on MC.**




| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 158 | 54.66 | 8.688 |
| Web (w) * | 215 | 51.73 | 8.569 |

* Significant difference between paper and web for minority ($t$=3.244, $p$=.00).

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# Assembling Objects (AO) by Ethnicity

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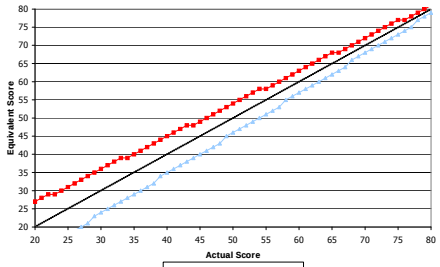
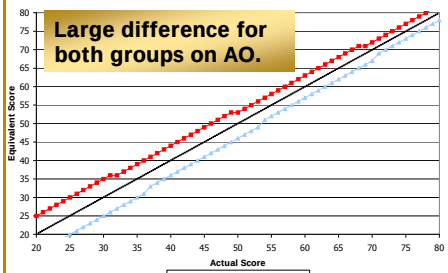
## Majority




| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 390 | 55.87 | 9.271 |
| Web (w) * | 343 | 52.15 | 10.225 |

## Minority

**Large difference for both groups on AO.**




| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 158 | 53.77 | 9.860 |
| Web (w) * | 213 | 50.28 | 10.437 |

* Significant difference between paper and web for majority ($t$=5.165, $p$=.00) and minority ($t$=3.260, $p$=.00).

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# Armed Forces Qualification Test (AFQT) by Ethnicity

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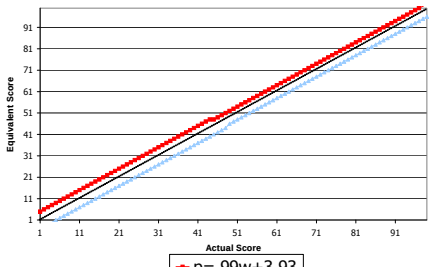
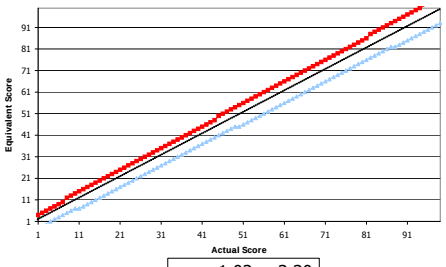
## Majority




| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 391 | 66.21 | 20.406 |
| Web (w) * | 349 | 62.88 | 20.602 |

## Minority




| | N | Mean | sd |
|---|---|---|---|
| Paper (p) | 158 | 56.46 | 23.062 |
| Web (w) * | 217 | 51.76 | 22.457 |

* Significant difference between paper and web for majority ($t$=2.206, $p$=.03) minority ($t$=1.977, $p$=.05).

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## Summary

- Web AFCT as programmed was stable
  - Only issue encountered related to lost connectivity of laptops to the server
- For overall scores, paper scores tend to be slightly higher, with noticeable differences for:
  - PC (5 points at lowest end of scale)
  - AO (about 7 points at lowest end of scale)
- Scores for males are similar to overall scores, with noticeable differences again for PC and AO

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## Summary (continued)

- Scores for females showed larger differences, perhaps due to the low number of women
  - Paper scores tended to be higher, with differences for PC and AO being 10 points or more
- Both majority and minority showed differences, most noticeable again on PC and AO (5 points or more)

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## Recommendations

- Record scores of study examinees, if better than their previous scores
- Determine a concept of operations for administering the Web AFCT to the Fleet
  - Decide if hosting through NKO is an option
  - Determine how to automatically update personnel files and incorporate IRT scoring
  - Find solution to administration aboard ship/submarine

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## Recommendations (continued)

- Brief MAPWG on results
  - Determine if any point difference (e.g., 2 pts or less) could be considered negligible in scores
  - Determine how web scores should be recorded in databases (i.e., record the paper equivalent score or the actual web score)
- Repeat study to test possible improvements
  - Change font type and size for PC
  - Use grease pencils on monitor or on transparency overlay for MC/AO
- Repeat or expand study to increase dataset

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# Project Team

**Customer Team**

Selection and Classification (N132)
Dr. Steve Watson
Dr. Lisa Mills

**TSC Great Lakes Team**

GSCM Christopher K. Knerr
FCCS Douglas S. Berry
ETCS Ryan N. Biggin
FCC Christopher D. Polk
GSM1 Jose Barraza
MM1 Dae S. Kim
EM1 Lawrence Palacio
FC2 William T. Griseto

**NPRST Team**

Zannette Uriell, Principal Investigator
Evangeline Clewis, SOC programming
David L. Alderton, Ph.D., programming
Paul Rosenfeld, Ph.D.

**NPRST Proctors**

Zannette Uriell
Paul Rosenfeld, Ph.D.
Rosemary Schultz, Ph.D.
Terri Ferraro
Perry Pena
Geoff Patrissi
Carol Newell
Gerry Wilcove
Joyce Alexander
Olivia Puentes
Rodney Myers

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# Web-AFCT Addendum: Comparing Record Scores of Two Administration Groups

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research at work

## Background

- NPRST conducted testing of web-based AFCT at NAVSTA Great Lakes in 2006
  - Project sponsored by Dr. Watson (N132G)
- Personnel generally assigned to two groups (paper-based administration or web-based administration) based upon last digit of SSN
  - Due to room limitations, respondents in certain sessions were more likely to take web-based administration, regardless of SSN
- At MAPWG's request, need to determine if two administration groups were different prior to testing, based upon ASVAB record scores

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## Data and Analyses

- ASVAB record data extracted for personnel with useable scores
- A few had record data scores of 0; those people were removed from both record and testing data for these analyses so that their 0 score would not impact computation of means
- *t*-test of independent means conducted, comparing the web-based administration group to the paper-based administration group, both prior to testing and with testing results

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# Record Data - Overall

| | Those who took web-based AFCT | | | Those who took paper-based AFCT | | | | |
|---|---|---|---|---|---|---|---|---|
| | N | Mean | SD | N | Mean | SD | T | p |
| GS | 723 | 54.09 | 7.431 | 657 | 54.85 | 7.446 | -1.896 | .058 |
| AR | 722 | 54.76 | 6.303 | 654 | 54.90 | 6.485 | -.406 | .685 |
| WK * | 724 | 52.39 | 6.995 | 645 | 53.43 | 6.864 | -2.770 | .006 |
| PC * | 722 | 53.81 | 6.079 | 642 | 54.71 | 5.799 | -2.789 | .005 |
| MK | 722 | 55.93 | 5.396 | 644 | 56.26 | 5.586 | -.922 | .357 |
| EI * | 718 | 54.69 | 8.637 | 643 | 56.03 | 8.386 | -2.897 | .004 |
| AS | 714 | 51.88 | 9.115 | 642 | 52.99 | 8.511 | -2.310 | .021 |
| MC | 707 | 55.67 | 8.364 | 642 | 56.49 | 8.078 | -1.828 | .068 |
| AO | 629 | 57.17 | 6.974 | 584 | 57.63 | 7.318 | -1.121 | .263 |
| VE * | 722 | 53.09 | 6.295 | 641 | 54.11 | 6.103 | -3.029 | .003 |
| AFQT | 716 | 64.41 | 18.065 | 642 | 66.83 | 17.778 | -2.483 | .013 |

* Indicates significant difference (p < .01) between the two groups.

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# Testing Data - Overall

| | Those who took web-based AFCT | | | Those who took paper-based AFCT | | | | |
|---|---|---|---|---|---|---|---|---|
| | N | Mean | SD | N | Mean | SD | T | p |
| GS | 723 | 53.34 | 7.545 | 657 | 54.02 | 8.015 | -1.623 | .105 |
| AR | 722 | 51.88 | 7.629 | 654 | 51.79 | 7.739 | .217 | .828 |
| WK | 724 | 53.42 | 7.155 | 645 | 53.77 | 7.627 | -.876 | .381 |
| PC * | 722 | 50.87 | 7.679 | 642 | 53.13 | 7.026 | -5.646 | .000 |
| MK | 722 | 55.93 | 5.396 | 644 | 56.26 | 5.586 | -1.513 | .130 |
| EI | 718 | 56.74 | 11.868 | 643 | 57.77 | 11.644 | -1.613 | .107 |
| AS | 714 | 50.81 | 10.234 | 642 | 51.58 | 9.861 | -1.407 | .160 |
| MC * | 707 | 55.37 | 8.854 | 642 | 57.34 | 8.939 | -4.063 | .000 |
| AO * | 629 | 51.86 | 10.202 | 584 | 55.17 | 9.233 | -5.909 | .000 |
| VE * | 722 | 52.69 | 7.008 | 641 | 53.82 | 7.290 | -2.915 | .000 |
| AFQT | 716 | 58.85 | 21.628 | 642 | 61.76 | 22.011 | -2.454 | .014 |

* Indicates significant difference (p < .01) between the two groups.

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# Record Data - Males

| | Those who took web-based AFCT | | | Those who took paper-based AFCT | | | | |
|---|---|---|---|---|---|---|---|---|
| | N | Mean | SD | N | Mean | SD | T | p |
| GS | 548 | 55.12 | 6.945 | 521 | 55.81 | 7.034 | -1.614 | .107 |
| AR | 547 | 55.48 | 6.201 | 517 | 55.37 | 6.354 | .286 | .775 |
| WK | 549 | 52.93 | 7.005 | 511 | 53.80 | 6.703 | -2.063 | .039 |
| PC | 548 | 54.07 | 6.121 | 508 | 54.89 | 5.872 | -2.218 | .027 |
| MK | 547 | 56.00 | 5.494 | 509 | 54.46 | 5.735 | -1.331 | .183 |
| EI | 543 | 56.16 | 8.334 | 508 | 57.28 | 8.078 | -2.210 | .027 |
| AS | 541 | 53.67 | 8.693 | 507 | 54.35 | 8.172 | -1.303 | .193 |
| MC | 535 | 57.18 | 7.936 | 507 | 57.64 | 7.912 | -.937 | .349 |
| AO | 473 | 57.63 | 6.853 | 462 | 57.92 | 7.420 | -.633 | .527 |
| VE | 548 | 53.54 | 6.292 | 508 | 54.44 | 5.996 | -2.376 | .018 |
| AFQT | 542 | 65.99 | 18.013 | 508 | 68.02 | 17.645 | -1.843 | .066 |

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# Testing Data - Males

| | Those who took web-based AFCT | | | Those who took paper-based AFCT | | | | |
|---|---|---|---|---|---|---|---|---|
| | N | Mean | SD | N | Mean | SD | T | p |
| GS | 548 | 54.26 | 7.298 | 521 | 54.64 | 8.015 | -.811 | .417 |
| AR | 547 | 52.38 | 7.660 | 517 | 52.20 | 7.786 | .380 | .704 |
| WK | 549 | 53.89 | 7.213 | 511 | 54.06 | 7.796 | -.369 | .712 |
| PC * | 548 | 54.10 | 7.742 | 508 | 53.31 | 7.042 | -4.840 | .000 |
| MK | 547 | 53.51 | 6.702 | 509 | 54.07 | 7.086 | -1.320 | .187 |
| EI | 543 | 58.84 | 11.653 | 508 | 59.19 | 11.669 | -.486 | .627 |
| AS | 541 | 52.70 | 9.896 | 507 | 54.35 | 8.172 | -.476 | .634 |
| MC * | 535 | 56.51 | 8.789 | 507 | 58.29 | 8.912 | -3.245 | .001 |
| AO * | 743 | 52.39 | 10.246 | 462 | 55.18 | 9.394 | -4.337 | .000 |
| VE | 548 | 53.07 | 7.045 | 508 | 54.08 | 7.411 | -2.270 | .023 |
| AFQT | 542 | 60.45 | 21.384 | 508 | 63.09 | 21.944 | -1.974 | .049 |

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* Indicates significant difference ($p < .01$) between the two groups.

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# Record Data - Females

| | Those who took web-based AFCT | | | Those who took paper-based AFCT | | | | |
|---|---|---|---|---|---|---|---|---|
| | N | Mean | SD | N | Mean | SD | T | p |
| GS | 110 | 49.99 | 7.933 | 90 | 52.10 | 7.801 | -1.885 | .061 |
| AR | 110 | 52.27 | 5.809 | 90 | 53.12 | 7.166 | -.927 | .355 |
| WK * | 110 | 50.25 | 6.664 | 87 | 53.15 | 7.313 | -2.905 | .004 |
| PC | 109 | 52.53 | 5.690 | 88 | 54.61 | 5.621 | -2.565 | .011 |
| MK | 110 | 55.75 | 5.087 | 88 | 56.20 | 4.797 | -.634 | .527 |
| EI | 110 | 48.81 | 6.798 | 88 | 50.02 | 7.171 | -1.215 | .226 |
| AS | 109 | 43.80 | 5.434 | 88 | 46.06 | 6.970 | -2.557 | .011 |
| MC * | 108 | 48.83 | 5.783 | 88 | 51.42 | 6.612 | -2.924 | .004 |
| AO | 100 | 55.56 | 6.450 | 79 | 57.11 | 6.528 | -1.588 | .114 |
| VE * | 109 | 51.04 | 6.901 | 87 | 54.52 | 6.344 | -2.971 | .003 |
| AFQT | 109 | 58.57 | 16.727 | 87 | 64.95 | 18.197 | -2.551 | .012 |

* Indicates significant difference ($p < .01$) between the two groups.

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# Testing Data - Females

| | Those who took web-based AFCT | | | Those who took paper-based AFCT | | | | |
|---|---|---|---|---|---|---|---|---|
| | N | Mean | SD | N | Mean | SD | T | p |
| GS * | 110 | 50.00 | 7.748 | 90 | 53.03 | 7.257 | -2.831 | .005 |
| AR | 110 | 49.96 | 7.212 | 90 | 51.67 | 6.722 | -1.720 | .087 |
| WK | 110 | 51.38 | 6.757 | 87 | 53.94 | 6.900 | -2.616 | .010 |
| PC * | 109 | 50.06 | 7.366 | 88 | 54.53 | 5.628 | -4.693 | .000 |
| MK | 110 | 51.95 | 5.927 | 88 | 53.61 | 6.510 | -1.874 | .062 |
| EI * | 110 | 47.84 | 8.596 | 88 | 52.90 | 9.047 | -4.021 | .000 |
| AS * | 109 | 42.22 | 6.148 | 88 | 44.94 | 6.464 | -3.017 | .003 |
| MC * | 108 | 49.98 | 7.060 | 88 | 53.98 | 7.680 | -3.792 | .000 |
| AO * | 100 | 49.99 | 9.615 | 79 | 56.37 | 8.426 | -4.652 | .000 |
| VE * | 109 | 51.04 | 6.901 | 87 | 54.52 | 6.344 | -3.635 | .000 |
| AFQT * | 109 | 52.77 | 21.748 | 87 | 62.62 | 19.524 | -3.295 | .001 |

* Indicates significant difference ($p < .01$) between the two groups.

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# Record Data - Majority

| | Those who took web-based AFCT | | | Those who took paper-based AFCT | | | | |
|---|---|---|---|---|---|---|---|---|
| | N | Mean | SD | N | Mean | SD | T | p |
| GS | 352 | 56.03 | 6.361 | 395 | 56.65 | 6.269 | -1.340 | .181 |
| AR | 350 | 55.92 | 6.019 | 394 | 55.90 | 6.358 | .044 | .965 |
| WK | 351 | 54.20 | 6.358 | 390 | 54.58 | 6.573 | -.798 | .425 |
| PC | 351 | 54.92 | 5.829 | 388 | 55.34 | 5.579 | -1.000 | .317 |
| MK | 349 | 56.13 | 5.733 | 389 | 56.56 | 5.590 | -1.031 | .303 |
| EI | 346 | 56.64 | 7.879 | 388 | 57.68 | 7.605 | -1.818 | .069 |
| AS | 345 | 55.23 | 8.288 | 387 | 55.21 | 7.806 | .034 | .973 |
| MC | 344 | 58.16 | 7.566 | 387 | 58.26 | 7.713 | -.177 | .860 |
| AO | 308 | 57.92 | 6.768 | 356 | 58.42 | 7.182 | -.919 | .359 |
| VE | 351 | 54.71 | 5.716 | 388 | 55.10 | 5.836 | -.916 | .360 |
| AFQT | 348 | 68.94 | 16.985 | 388 | 70.00 | 16.544 | -.857 | .392 |

* Indicates significant difference ($p < .01$) between the two groups.

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# Testing Data - Majority

| | Those who took web-based AFCT | | | Those who took paper-based AFCT | | | | |
|---|---|---|---|---|---|---|---|---|
| | N | Mean | SD | N | Mean | SD | T | p |
| GS | 352 | 55.23 | 7.004 | 395 | 55.70 | 7.465 | -.884 | .377 |
| AR | 350 | 52.61 | 7.788 | 394 | 52.97 | 7.412 | -.646 | .519 |
| WK | 351 | 55.07 | 6.369 | 390 | 55.14 | 7.304 | -.138 | .890 |
| PC * | 351 | 51.74 | 7.549 | 388 | 54.05 | 6.833 | -4.366 | .000 |
| MK | 349 | 53.83 | 6.714 | 389 | 54.63 | 6.980 | -1.583 | .114 |
| EI | 346 | 59.53 | 11.616 | 388 | 59.66 | 11.256 | -.154 | .878 |
| AS | 345 | 54.12 | 9.691 | 387 | 53.94 | 9.411 | .255 | .799 |
| MC | 344 | 57.51 | 8.418 | 387 | 58.93 | 8.723 | -2.233 | .026 |
| AO * | 308 | 52.63 | 10.134 | 356 | 56.08 | 9.085 | -4.625 | .000 |
| VE | 351 | 54.13 | 6.394 | 388 | 55.09 | 7.052 | -1.931 | .054 |
| AFQT | 348 | 62.88 | 20.632 | 388 | 66.28 | 20.346 | -2.248 | .025 |

* Indicates significant difference ($p < .01$) between the two groups.

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# Record Data - Minority

| | Those who took web-based AFCT | | | Those who took paper-based AFCT | | | | |
|---|---|---|---|---|---|---|---|---|
| | N | Mean | SD | N | Mean | SD | T | p |
| GS | 216 | 51.00 | 7.623 | 166 | 52.57 | 7.720 | -1.984 | .048 |
| AR | 217 | 53.52 | 6.317 | 163 | 53.34 | 6.757 | .267 | .790 |
| WK * | 218 | 49.61 | 6.875 | 159 | 52.21 | 6.842 | -3.962 | .000 |
| PC * | 216 | 52.06 | 6.084 | 158 | 54.10 | 6.011 | -3.219 | .001 |
| MK * | 218 | 55.82 | 4.997 | 158 | 56.28 | 5.746 | 6.864 | .000 |
| EI | 217 | 51.99 | 8.319 | 158 | 53.27 | 8.979 | -1.423 | .156 |
| AS | 216 | 47.27 | 7.944 | 158 | 48.74 | 8.161 | -1.747 | .081 |
| MC | 212 | 52.06 | 7.930 | 158 | 53.50 | 7.685 | -1.751 | .081 |
| AO | 188 | 55.88 | 6.986 | 141 | 56.66 | 7.294 | -.983 | .326 |
| VE * | 217 | 50.57 | 6.231 | 158 | 53.12 | 6.134 | -3.939 | .000 |
| AFQT * | 215 | 58.01 | 17.647 | 158 | 63.32 | 19.258 | -2.762 | .006 |

* Indicates significant difference ($p < .01$) between the two groups.

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# Testing Data - Minority

| | Those who took web-based AFCT | | | Those who took paper-based AFCT | | | | |
|---|---|---|---|---|---|---|---|---|
| | N | Mean | SD | N | Mean | SD | T | p |
| GS | 216 | 50.61 | 7.420 | 166 | 52.06 | 8.227 | -1.806 | .072 |
| AR | 217 | 51.14 | 7.447 | 163 | 50.18 | 8.221 | 1.189 | .235 |
| WK | 218 | 50.52 | 7.946 | 159 | 52.01 | 8.183 | -1.943 | .053 |
| PC * | 216 | 49.09 | 7.976 | 158 | 52.39 | 7.127 | -4.132 | .000 |
| MK | 218 | 52.03 | 6.441 | 158 | 52.50 | 7.173 | -.623 | .534 |
| EI | 217 | 52.66 | 11.507 | 158 | 55.33 | 11.601 | -2.211 | .028 |
| AS | 216 | 46.19 | 8.776 | 158 | 46.68 | 9.216 | -.522 | .602 |
| MC * | 212 | 51.78 | 8.580 | 158 | 54.66 | 8.688 | -3.177 | .002 |
| AO * | 188 | 50.15 | 10.448 | 141 | 53.71 | 9.854 | -3.133 | .002 |
| VE * | 217 | 49.96 | 7.689 | 158 | 52.39 | 7.605 | -3.036 | .003 |
| AFQT | 215 | 51.86 | 22.497 | 158 | 56.46 | 23.062 | -1.931 | .054 |

* Indicates significant difference ($p < .01$) between the two groups.

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# Summary

- The two groups were not equivalent overall when they participated in the web-based AFCT effects study
  - Male and majority subgroups were equivalent based on record data, but females and minority were not
  - In the overall group, those who took the paper-based version were already slightly better in WK and PC (and, thereby, VE) and EI
- Effects study results for overall group show differences in PC, MC, AO, and VE
  - Original differences between the two groups for WK disappear
  - MC and AO show differences that are not directly attributable to any pre-existing differences between the two groups

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# Appendix F:
# Detailed Results by Test Question

## Table F-1
## GS for all respondents

| Question | Web (N = 741) | | | | | | Paper (N = 664) | | | | | | Pearson's Chi-2 | df | sig |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | | | |
| | # | % | # | % | # | % | # | % | # | % | # | % | | | |
| **GS01** | 689 | 93 | 51 | 7 | 1 | 0 | 607 | 91 | 57 | 8 | 0 | 0 | 2.309 | 2 | 0.315 |
| **GS02** | 685 | 92 | 56 | 8 | 0 | 0 | 630 | 95 | 33 | 5 | 1 | 0 | 5.039 | 2 | 0.080 |
| **GS03** | 725 | 98 | 15 | 2 | 1 | 0 | 639 | 96 | 25 | 4 | 0 | 0 | 4.717 | 2 | 0.095 |
| **GS04** | 660 | 89 | 81 | 11 | 0 | 0 | 608 | 92 | 56 | 8 | 0 | 0 | 2.482 | 1 | 0.115 |
| **GS05** | 674 | 91 | 67 | 8 | 0 | 0 | 598 | 90 | 66 | 10 | 0 | 0 | 0.329 | 1 | 0.566 |
| **GS06** | 660 | 89 | 79 | 11 | 2 | 0 | 602 | 91 | 61 | 9 | 1 | 0 | 1.097 | 2 | 0.578 |
| **GS07** | 661 | 89 | 78 | 11 | 2 | 0 | 602 | 91 | 62 | 9 | 0 | 0 | 2.372 | 2 | 0.305 |
| **GS08** | 583 | 79 | 154 | 21 | 4 | 0 | 543 | 82 | 120 | 18 | 1 | 0 | 3.230 | 2 | 0.199 |
| **GS09** | 630 | 85 | 110 | 15 | 1 | 0 | 571 | 86 | 93 | 14 | 0 | 0 | 1.105 | 2 | 0.575 |
| **GS10** | 559 | 75 | 177 | 25 | 5 | 1 | 536 | 81 | 127 | 19 | 1 | 0 | 7.175 | 2 | 0.028 |
| **GS11** | 722 | 97 | 17 | 3 | 2 | 0 | 637 | 96 | 27 | 4 | 0 | 0 | 5.385 | 2 | 0.068 |
| **GS12** | 630 | 85 | 109 | 15 | 2 | 0 | 577 | 87 | 87 | 13 | 0 | 0 | 2.584 | 2 | 0.275 |
| **GS13** | 435 | 59 | 305 | 41 | 1 | 0 | 416 | 63 | 245 | 37 | 3 | 0 | 3.761 | 2 | 0.153 |
| **GS14** | 676 | 91 | 63 | 8 | 2 | 0 | 603 | 91 | 59 | 8 | 2 | 0 | 0.078 | 2 | 0.962 |
| **GS15** | 398 | 54 | 343 | 46 | 0 | 0 | 347 | 52 | 315 | 48 | 2 | 0 | 2.470 | 2 | 0.291 |
| **GS16** | 577 | 78 | 162 | 22 | 2 | 0 | 522 | 79 | 141 | 21 | 1 | 0 | 0.322 | 2 | 0.851 |
| **GS17** | 563 | 76 | 175 | 24 | 3 | 0 | 510 | 77 | 152 | 23 | 2 | 0 | 0.216 | 2 | 0.897 |
| **GS18** | 406 | 55 | 329 | 45 | 6 | 1 | 359 | 54 | 302 | 46 | 3 | 0 | 0.825 | 2 | 0.662 |
| **GS19** | 478 | 65 | 255 | 35 | 8 | 1 | 427 | 64 | 234 | 36 | 3 | 0 | 1.834 | 2 | 0.400 |
| **GS20** | 393 | 53 | 338 | 47 | 10 | 1 | 377 | 57 | 283 | 43 | 4 | 0 | 3.566 | 2 | 0.168 |
| **GS21** | 399 | 54 | 328 | 46 | 14 | 2 | 367 | 55 | 292 | 45 | 5 | 1 | 3.481 | 2 | 0.175 |
| **GS22** | 289 | 39 | 435 | 61 | 17 | 2 | 302 | 45 | 355 | 55 | 7 | 1 | 8.359 | 2 | 0.015 |
| **GS23** | 219 | 30 | 501 | 70 | 21 | 3 | 213 | 32 | 439 | 68 | 12 | 2 | 2.415 | 2 | 0.299 |
| **GS24** | 148 | 20 | 571 | 80 | 22 | 3 | 126 | 19 | 529 | 81 | 9 | 1 | 4.616 | 2 | 0.099 |
| **GS25** | 301 | 41 | 411 | 59 | 29 | 4 | 273 | 41 | 377 | 59 | 14 | 2 | 3.857 | 2 | 0.145 |

## Table F-2
## GS for male respondents

| Question | Web (N = 552) | | | | | | Paper (N = 525) | | | | | | Pearson's Chi-2 | df | sig |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | | | |
| | # | % | # | % | # | % | # | % | # | % | # | % | | | |
| **GS01** | 523 | 95 | 28 | 5 | 1 | 0 | 486 | 93 | 39 | 7 | 0 | 0 | 3.488 | 2 | 0.175 |
| **GS02** | 524 | 95 | 28 | 5 | 0 | 0 | 505 | 96 | 19 | 4 | 1 | 0 | 2.399 | 2 | 0.301 |
| **GS03** | 544 | 99 | 7 | 1 | 1 | 0 | 506 | 96 | 19 | 4 | 0 | 0 | 7.241 | 2 | 0.027 |
| **GS04** | 484 | 88 | 68 | 12 | 0 | 0 | 481 | 92 | 44 | 8 | 0 | 0 | 4.478 | 1 | 0.034 |
| **GS05** | 507 | 92 | 45 | 8 | 0 | 0 | 477 | 91 | 48 | 9 | 0 | 0 | 0.335 | 1 | 0.563 |
| **GS06** | 500 | 91 | 50 | 9 | 2 | 0 | 478 | 91 | 46 | 9 | 1 | 0 | 0.318 | 2 | 0.853 |
| **GS07** | 508 | 92 | 43 | 8 | 1 | 0 | 486 | 93 | 39 | 7 | 0 | 0 | 1.006 | 2 | 0.605 |
| **GS08** | 462 | 84 | 86 | 16 | 4 | 1 | 439 | 84 | 85 | 16 | 1 | 0 | 1.717 | 2 | 0.424 |
| **GS09** | 485 | 88 | 67 | 12 | 0 | 0 | 456 | 87 | 69 | 13 | 0 | 0 | 0.246 | 1 | 0.620 |
| **GS10** | 437 | 79 | 112 | 21 | 3 | 1 | 437 | 83 | 87 | 17 | 1 | 0 | 3.466 | 2 | 0.177 |
| **GS11** | 539 | 98 | 11 | 2 | 2 | 0 | 505 | 96 | 20 | 4 | 0 | 0 | 5.046 | 2 | 0.080 |
| **GS12** | 480 | 87 | 70 | 13 | 2 | 0 | 462 | 88 | 63 | 12 | 0 | 0 | 2.037 | 2 | 0.361 |
| **GS13** | 337 | 61 | 214 | 39 | 1 | 0 | 358 | 68 | 165 | 32 | 2 | 0 | 6.630 | 2 | 0.036 |
| **GS14** | 506 | 92 | 44 | 8 | 2 | 0 | 476 | 91 | 48 | 8 | 1 | 0 | 0.747 | 2 | 0.688 |
| **GS15** | 291 | 53 | 261 | 47 | 0 | 0 | 274 | 52 | 251 | 48 | 0 | 0 | 0.030 | 1 | 0.863 |
| **GS16** | 436 | 79 | 115 | 21 | 1 | 0 | 411 | 78 | 114 | 22 | 0 | 0 | 1.066 | 2 | 0.587 |
| **GS17** | 426 | 77 | 123 | 23 | 3 | 1 | 410 | 78 | 114 | 22 | 1 | 0 | 0.972 | 2 | 0.615 |
| **GS18** | 314 | 57 | 232 | 43 | 6 | 1 | 292 | 56 | 231 | 44 | 2 | 0 | 2.125 | 2 | 0.346 |
| **GS19** | 365 | 66 | 181 | 34 | 6 | 1 | 340 | 65 | 184 | 35 | 1 | 0 | 3.808 | 2 | 0.149 |
| **GS20** | 305 | 55 | 238 | 45 | 9 | 2 | 312 | 59 | 211 | 40 | 2 | 0 | 5.484 | 2 | 0.064 |
| **GS21** | 316 | 57 | 223 | 43 | 13 | 2 | 289 | 55 | 233 | 45 | 3 | 1 | 7.002 | 2 | 0.030 |
| **GS22** | 233 | 42 | 304 | 58 | 15 | 3 | 259 | 49 | 261 | 51 | 5 | 1 | 8.975 | 2 | 0.011 |
| **GS23** | 177 | 32 | 356 | 68 | 19 | 3 | 175 | 33 | 342 | 67 | 8 | 2 | 4.099 | 2 | 0.129 |
| **GS24** | 109 | 20 | 425 | 80 | 18 | 3 | 106 | 20 | 414 | 80 | 5 | 1 | 6.861 | 2 | 0.032 |
| **GS25** | 233 | 42 | 294 | 58 | 25 | 5 | 215 | 41 | 301 | 59 | 9 | 2 | 7.663 | 2 | 0.022 |

## Table F-3
## GS for female respondents

| Question | Web (N = 111) | | | | | | Paper (N = 90) | | | | | | Pearson's chi-2 | df | sig |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | | | |
| | # | % | # | % | # | % | # | % | # | % | # | % | | | |
| **GS01** | 95 | 86 | 16 | 14 | 0 | 0 | 80 | 89 | 10 | 11 | 0 | 0 | 0.482 | 1 | 0.488 |
| **GS02** | 91 | 82 | 20 | 18 | 0 | 0 | 79 | 88 | 11 | 12 | 0 | 0 | 1.280 | 1 | 0.258 |
| **GS03** | 103 | 93 | 8 | 7 | 0 | 0 | 86 | 96 | 4 | 4 | 0 | 0 | 0.676 | 1 | 0.411 |
| **GS04** | 107 | 96 | 4 | 4 | 0 | 0 | 89 | 99 | 1 | 1 | 0 | 0 | 1.273 | 1 | 0.259 |
| **GS05** | 96 | 86 | 15 | 14 | 0 | 0 | 77 | 86 | 13 | 83 | 0 | 0 | 0.036 | 1 | 0.850 |
| **GS06** | 94 | 85 | 17 | 15 | 0 | 0 | 86 | 96 | 4 | 4 | 0 | 0 | 6.278 | 1 | 0.012 |
| **GS07** | 89 | 81 | 21 | 19 | 1 | 1 | 76 | 84 | 14 | 16 | 0 | 0 | 1.244 | 2 | 0.537 |
| **GS08** | 66 | 59 | 45 | 41 | 0 | 0 | 64 | 71 | 26 | 29 | 0 | 0 | 2.953 | 1 | 0.086 |
| **GS09** | 83 | 75 | 27 | 25 | 1 | 1 | 77 | 86 | 13 | 14 | 0 | 0 | 3.974 | 2 | 0.137 |
| **GS10** | 67 | 61 | 42 | 39 | 2 | 2 | 65 | 72 | 25 | 28 | 0 | 0 | 4.196 | 2 | 0.123 |
| **GS11** | 109 | 98 | 2 | 2 | 0 | 0 | 87 | 97 | 3 | 3 | 0 | 0 | 0.481 | 1 | 0.488 |
| **GS12** | 85 | 77 | 26 | 23 | 0 | 0 | 78 | 87 | 12 | 13 | 0 | 0 | 3.301 | 1 | 0.069 |
| **GS13** | 52 | 47 | 59 | 53 | 0 | 0 | 36 | 40 | 54 | 60 | 0 | 0 | 0.947 | 1 | 0.331 |
| **GS14** | 100 | 90 | 11 | 10 | 0 | 0 | 87 | 97 | 3 | 13 | 0 | 0 | 3.317 | 1 | 0.069 |
| **GS15** | 67 | 60 | 44 | 40 | 0 | 0 | 49 | 54 | 41 | 51 | 0 | 0 | 0.713 | 1 | 0.399 |
| **GS16** | 86 | 78 | 24 | 22 | 1 | 1 | 79 | 88 | 11 | 21 | 0 | 0 | 3.975 | 2 | 0.137 |
| **GS17** | 81 | 73 | 30 | 27 | 0 | 0 | 70 | 78 | 20 | 30 | 0 | 0 | 0.614 | 1 | 0.433 |
| **GS18** | 52 | 47 | 59 | 53 | 0 | 0 | 53 | 59 | 37 | 47 | 0 | 0 | 2.889 | 1 | 0.089 |
| **GS19** | 75 | 69 | 34 | 31 | 2 | 2 | 55 | 62 | 34 | 45 | 1 | 1 | 1.230 | 2 | 0.541 |
| **GS20** | 54 | 49 | 56 | 51 | 1 | 1 | 44 | 49 | 46 | 56 | 0 | 0 | 0.816 | 2 | 0.665 |
| **GS21** | 48 | 43 | 63 | 57 | 0 | 0 | 50 | 56 | 39 | 50 | 1 | 1 | 4.543 | 2 | 0.103 |
| **GS22** | 28 | 25 | 82 | 75 | 1 | 1 | 31 | 35 | 58 | 69 | 1 | 1 | 2.096 | 2 | 0.351 |
| **GS23** | 28 | 25 | 83 | 75 | 0 | 0 | 27 | 30 | 62 | 73 | 1 | 1 | 1.886 | 2 | 0.389 |
| **GS24** | 22 | 20 | 87 | 80 | 2 | 2 | 13 | 15 | 76 | 87 | 1 | 1 | 1.209 | 2 | 0.546 |
| **GS25** | 33 | 30 | 76 | 70 | 2 | 2 | 43 | 48 | 46 | 52 | 1 | 1 | 6.908 | 2 | 0.032 |

## Table F-4
## GS for majority respondents

| Question | Web (N = 353) | | | | | | Paper (N = 399) | | | | | | Pearson's Chi-2 | df | sig |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | | | |
| | # | % | # | % | # | % | # | % | # | % | # | % | | | |
| **GS01** | 338 | 96 | 14 | 4 | 1 | 0 | 374 | 94 | 25 | 6 | 0 | 0 | 3.121 | 2 | 0.210 |
| **GS02** | 337 | 95 | 16 | 5 | 0 | 0 | 384 | 96 | 14 | 4 | 1 | 0 | 1.388 | 2 | 0.499 |
| **GS03** | 349 | 99 | 4 | 1 | 0 | 0 | 388 | 97 | 11 | 3 | 0 | 0 | 2.526 | 1 | 0.112 |
| **GS04** | 312 | 88 | 41 | 12 | 0 | 0 | 374 | 94 | 25 | 6 | 0 | 0 | 6.694 | 1 | 0.010 |
| **GS05** | 327 | 93 | 26 | 7 | 0 | 0 | 367 | 92 | 32 | 8 | 0 | 0 | 0.113 | 1 | 0.737 |
| **GS06** | 330 | 93 | 23 | 7 | 0 | 0 | 373 | 93 | 26 | 7 | 0 | 0 | 0.000 | 1 | 1.000 |
| **GS07** | 326 | 92 | 25 | 7 | 2 | 1 | 366 | 92 | 33 | 8 | 0 | 0 | 2.612 | 2 | 0.271 |
| **GS08** | 303 | 86 | 48 | 14 | 2 | 1 | 340 | 85 | 59 | 15 | 0 | 0 | 2.455 | 2 | 0.293 |
| **GS09** | 314 | 89 | 39 | 10 | 0 | 0 | 360 | 90 | 39 | 10 | 0 | 0 | 0.327 | 1 | 0.568 |
| **GS10** | 306 | 87 | 47 | 13 | 0 | 0 | 340 | 85 | 59 | 15 | 0 | 0 | 0.335 | 1 | 0.563 |
| **GS11** | 349 | 99 | 3 | 1 | 1 | 0 | 387 | 97 | 12 | 3 | 0 | 0 | 5.569 | 2 | 0.062 |
| **GS12** | 304 | 88 | 48 | 14 | 1 | 0 | 355 | 89 | 44 | 11 | 0 | 0 | 2.316 | 2 | 0.314 |
| **GS13** | 230 | 65 | 122 | 35 | 1 | 0 | 275 | 69 | 124 | 31 | 0 | 0 | 2.221 | 2 | 0.329 |
| **GS14** | 326 | 92 | 27 | 8 | 0 | 0 | 367 | 92 | 31 | 8 | 1 | 0 | 0.891 | 2 | 0.640 |
| **GS15** | 193 | 55 | 160 | 45 | 0 | 0 | 217 | 54 | 182 | 46 | 0 | 0 | 0.006 | 1 | 0.937 |
| **GS16** | 288 | 82 | 64 | 18 | 1 | 0 | 334 | 84 | 65 | 26 | 0 | 0 | 1.602 | 2 | 0.449 |
| **GS17** | 284 | 80 | 69 | 20 | 0 | 0 | 315 | 79 | 84 | 21 | 0 | 0 | 0.262 | 1 | 0.609 |
| **GS18** | 231 | 65 | 121 | 34 | 1 | 0 | 248 | 62 | 151 | 38 | 0 | 0 | 2.106 | 2 | 0.349 |
| **GS19** | 239 | 68 | 111 | 31 | 3 | 1 | 273 | 68 | 126 | 32 | 0 | 0 | 3.406 | 2 | 0.182 |
| **GS20** | 199 | 56 | 151 | 43 | 3 | 1 | 239 | 60 | 159 | 40 | 1 | 0 | 2.053 | 2 | 0.358 |
| **GS21** | 198 | 198 | 152 | 43 | 3 | 1 | 219 | 55 | 178 | 45 | 2 | 0 | 0.494 | 2 | 0.781 |
| **GS22** | 155 | 44 | 194 | 55 | 4 | 1 | 207 | 52 | 188 | 48 | 4 | 1 | 4.768 | 2 | 0.092 |
| **GS23** | 112 | 32 | 236 | 66.856 | 5 | 1 | 138 | 35 | 255 | 65 | 6 | 2 | 0.719 | 2 | 0.698 |
| **GS24** | 70 | 20 | 278 | 78.754 | 5 | 1 | 86 | 22 | 209 | 78 | 4 | 1 | 0.578 | 2 | 0.749 |
| **GS25** | 157 | 44 | 189 | 53.541 | 7 | 2 | 175 | 44 | 116 | 56 | 8 | 2 | 0.029 | 2 | 0.986 |

## Table F-5
## GS for minority respondents

| | Web (N = 219) | | | | | | Paper (N = 166) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | Pearson's | | |
| Question | # | % | # | % | # | % | # | % | # | % | # | % | Chi-2 | df | sig |
| **GS01** | 193 | 88 | 26 | 12 | 0 | 0 | 149 | 90 | 17 | 10 | 0 | 0 | 0.253 | 1 | 0.615 |
| **GS02** | 195 | 89 | 24 | 11 | 0 | 0 | 150 | 90 | 16 | 10 | 0 | 0 | 0.177 | 1 | 0.674 |
| **GS03** | 209 | 96 | 9 | 4 | 1 | 0 | 157 | 95 | 9 | 5 | 0 | 0 | 1.113 | 2 | 0.573 |
| **GS04** | 192 | 88 | 27 | 12 | 0 | 0 | 151 | 91 | 15 | 9 | 0 | 0 | 1.053 | 1 | 0.305 |
| **GS05** | 190 | 87 | 29 | 13 | 0 | 0 | 143 | 86 | 23 | 14 | 0 | 0 | 0.030 | 1 | 0.862 |
| **GS06** | 185 | 85 | 33 | 15 | 1 | 0 | 147 | 89 | 18 | 11 | 1 | 0 | 1.493 | 2 | 0.474 |
| **GS07** | 186 | 85 | 33 | 15 | 0 | 0 | 150 | 90 | 16 | 10 | 0 | 0 | 2.506 | 1 | 0.113 |
| **GS08** | 154 | 71 | 64 | 29 | 1 | 0 | 128 | 77 | 38 | 23 | 0 | 0 | 2.781 | 2 | 0.249 |
| **GS09** | 178 | 81 | 41 | 19 | 0 | 0 | 134 | 81 | 32 | 19 | 0 | 0 | 0.019 | 1 | 0.890 |
| **GS10*** | 134 | 61 | 84 | 39 | 1 | 0 | 130 | 78 | 36 | 22 | 0 | 0 | 13.215 | 2 | 0.001 |
| **GS11** | 209 | 96 | 9 | 4 | 1 | 0 | 157 | 95 | 9 | 5 | 0 | 0 | 1.113 | 2 | 0.573 |
| **GS12** | 185 | 85 | 33 | 15 | 1 | 0 | 141 | 85 | 25 | 15 | 0 | 0 | 0.760 | 2 | 0.684 |
| **GS13** | 99 | 45 | 120 | 55 | 0 | 0 | 90 | 55 | 75 | 45 | 1 | 0 | 4.604 | 2 | 0.100 |
| **GS14** | 197 | 91 | 20 | 8 | 2 | 1 | 150 | 90 | 16 | 10 | 0 | 0 | 1.544 | 2 | 0.462 |
| **GS15** | 112 | 51 | 107 | 49 | 0 | 0 | 84 | 51 | 82 | 49 | 0 | 0 | 0.011 | 1 | 0.917 |
| **GS16** | 162 | 74 | 57 | 26 | 0 | 0 | 120 | 72 | 46 | 28 | 0 | 0 | 0.137 | 1 | 0.712 |
| **GS17** | 153 | 71 | 64 | 29 | 2 | 1 | 124 | 75 | 41 | 25 | 1 | 0 | 1.133 | 2 | 0.568 |
| **GS18** | 86 | 40 | 130 | 60 | 3 | 1 | 72 | 44 | 93 | 56 | 1 | 0 | 1.104 | 2 | 0.576 |
| **GS19** | 137 | 63 | 79 | 37 | 3 | 1 | 96 | 58 | 69 | 42 | 1 | 0 | 1.625 | 2 | 0.444 |
| **GS20** | 107 | 50 | 108 | 50 | 4 | 2 | 87 | 53 | 78 | 47 | 1 | 0 | 1.432 | 2 | 0.489 |
| **GS21** | 120 | 57 | 92 | 43 | 7 | 3 | 89 | 54 | 76 | 46 | 1 | 0 | 3.390 | 2 | 0.184 |
| **GS22** | 71 | 33 | 141 | 67 | 7 | 3 | 65 | 39 | 100 | 35 | 1 | 0 | 4.530 | 2 | 0.104 |
| **GS23** | 66 | 32 | 143 | 68 | 10 | 5 | 44 | 27 | 121 | 54 | 1 | 0 | 6.423 | 2 | 0.040 |
| **GS24** | 38 | 18 | 172 | 82 | 9 | 4 | 24 | 15 | 141 | 76 | 1 | 0 | 5.439 | 2 | 0.066 |
| **GS25** | 80 | 38 | 129 | 62 | 10 | 5 | 68 | 41 | 97 | 32 | 1 | 0 | 5.679 | 2 | 0.058 |

* Significant difference between paper and web ($p < .01$).

## Table F-6
## AR for all respondents

| | Web (N = 739) | | | | | | Paper (N = 660) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | | | |
| Question | # | % | # | % | # | % | # | % | # | % | # | % | Pearson's Chi-2 | df | sig |
| **AR01** | 707 | 96 | 28 | 4 | 4 | 0 | 621 | 94 | 39 | 6 | 0 | 0 | 5.166 | 1 | 0.023 |
| **AR02** | 680 | 92 | 57 | 8 | 2 | 0 | 598 | 91 | 61 | 9 | 1 | 0 | 1.243 | 2 | 0.537 |
| **AR03** | 668 | 90 | 68 | 10 | 3 | 0 | 603 | 91 | 56 | 9 | 1 | 0 | 1.053 | 2 | 0.591 |
| **AR04** | 618 | 84 | 118 | 16 | 3 | 0 | 534 | 81 | 126 | 19 | 0 | 0 | 5.073 | 2 | 0.079 |
| **AR05** | 610 | 83 | 124 | 17 | 5 | 1 | 527 | 80 | 131 | 20 | 2 | 0 | 3.205 | 2 | 0.201 |
| **AR06** | 637 | 86 | 100 | 14 | 2 | 0 | 570 | 86 | 89 | 14 | 1 | 0 | 0.798 | 2 | 0.671 |
| **AR07** | 651 | 88 | 87 | 12 | 1 | 0 | 571 | 87 | 88 | 13 | 1 | 0 | 0.954 | 2 | 0.621 |
| **AR08** | 646 | 87 | 92 | 13 | 1 | 0 | 573 | 87 | 86 | 13 | 1 | 0 | 0.221 | 2 | 0.895 |
| **AR09** | 604 | 82 | 133 | 18 | 2 | 0 | 537 | 81 | 121 | 19 | 2 | 0 | 0.142 | 2 | 0.931 |
| **AR10** | 621 | 84 | 115 | 16 | 3 | 0 | 561 | 85 | 97 | 15 | 2 | 0 | 0.642 | 2 | 0.725 |
| **AR11** | 612 | 83 | 122 | 17 | 5 | 1 | 549 | 83 | 110 | 17 | 1 | 0 | 2.268 | 2 | 0.322 |
| **AR12** | 616 | 83 | 121 | 17 | 2 | 0 | 561 | 85 | 98 | 15 | 1 | 0 | 1.176 | 2 | 0.556 |
| **AR13** | 533 | 72 | 201 | 28 | 5 | 1 | 465 | 70 | 192 | 30 | 3 | 0 | 1.482 | 2 | 0.477 |
| **AR14** | 508 | 69 | 225 | 31 | 6 | 1 | 476 | 72 | 182 | 28 | 2 | 0 | 2.554 | 2 | 0.279 |
| **AR15** | 421 | 57 | 305 | 43 | 13 | 2 | 369 | 56 | 284 | 44 | 7 | 1 | 2.951 | 2 | 0.229 |
| **AR16** | 495 | 67 | 241 | 33 | 3 | 0 | 429 | 65 | 227 | 35 | 4 | 0 | 0.596 | 2 | 0.742 |
| **AR17** | 524 | 71 | 209 | 29 | 6 | 1 | 450 | 68 | 203 | 32 | 7 | 1 | 1.193 | 2 | 0.551 |
| **AR18** | 422 | 57 | 311 | 43 | 6 | 1 | 404 | 61 | 250 | 39 | 6 | 1 | 2.552 | 2 | 0.279 |
| **AR19*** | 506 | 68 | 223 | 32 | 10 | 1 | 413 | 63 | 244 | 37 | 3 | 0 | 10.008 | 2 | 0.007 |
| **AR20** | 411 | 56 | 304 | 44 | 24 | 3 | 328 | 50 | 321 | 50 | 11 | 2 | 9.199 | 2 | 0.010 |
| **AR21** | 485 | 66 | 231 | 34 | 23 | 3 | 415 | 63 | 234 | 37 | 11 | 2 | 5.071 | 2 | 0.079 |
| **AR22*** | 292 | 40 | 406 | 60 | 41 | 5 | 319 | 48 | 327 | 52 | 14 | 2 | 18.077 | 2 | 0.000 |
| **AR23*** | 445 | 60 | 252 | 40 | 42 | 5 | 405 | 61 | 244 | 39 | 11 | 2 | 14.638 | 2 | 0.001 |
| **AR24*** | 343 | 46 | 329 | 54 | 67 | 9 | 315 | 48 | 319 | 52 | 26 | 4 | 14.440 | 2 | 0.001 |

## Table F-6
## AR for all respondents

| | Web (N = 739) | | | | | | Paper (N = 660) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | | | |
| Question | # | % | # | % | # | % | # | % | # | % | # | % | Pearson's Chi-2 | df | sig |
| **AR25*** | 343 | 46 | 325 | 54 | 71 | 10 | 332 | 50 | 303 | 50 | 25 | 4 | 15.758 | 2 | 0.000 |
| **AR26*** | 316 | 43 | 331 | 57 | 92 | 12 | 296 | 45 | 329 | 55 | 35 | 5 | 19.840 | 2 | 0.000 |
| **AR27*** | 245 | 33 | 379 | 67 | 115 | 16 | 233 | 35 | 378 | 65 | 49 | 7 | 20.852 | 2 | 0.000 |
| **AR28*** | 395 | 53 | 222 | 47 | 122 | 16 | 368 | 56 | 248 | 44 | 44 | 7 | 32.660 | 2 | 0.000 |
| **AR29*** | 274 | 37 | 316 | 63 | 149 | 20 | 268 | 41 | 345 | 59 | 47 | 7 | 47.492 | 2 | 0.000 |
| **AR30*** | 153 | 21 | 425 | 79 | 161 | 22 | 173 | 26 | 432 | 74 | 55 | 8 | 46.661 | 2 | 0.000 |

* Significant difference between paper and web ($p < .01$).

## Table F-7
## AR for male respondents

| Question | Web (N = 549) | | | | | | Paper (N =5 21) | | | | | | Pearson's Chi-2 | df | sig |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | | | |
| | # | % | # | % | # | % | # | % | # | % | # | % | | | |
| **AR01** | 522 | 95 | 25 | 5 | 2 | 0 | 486 | 93 | 35 | 7 | 0 | 0 | 2.679 | 1 | 0.102 |
| **AR02** | 503 | 92 | 44 | 8 | 2 | 0 | 467 | 90 | 53 | 10 | 1 | 0 | 1.732 | 2 | 0.421 |
| **AR03** | 495 | 90 | 52 | 10 | 2 | 0 | 477 | 92 | 43 | 8 | 1 | 0 | 0.960 | 2 | 0.619 |
| **AR04** | 459 | 84 | 87 | 16 | 3 | 1 | 419 | 80 | 102 | 20 | 0 | 0 | 5.494 | 2 | 0.064 |
| **AR05** | 460 | 84 | 86 | 16 | 3 | 1 | 421 | 81 | 99 | 19 | 1 | 0 | 2.865 | 2 | 0.239 |
| **AR06** | 487 | 89 | 61 | 11 | 1 | 0 | 457 | 88 | 63 | 12 | 1 | 0 | 0.516 | 2 | 0.773 |
| **AR07** | 484 | 88 | 65 | 12 | 0 | 0 | 456 | 88 | 64 | 12 | 1 | 0 | 0.045 | 2 | 0.978 |
| **AR08** | 482 | 88 | 66 | 12 | 1 | 0 | 458 | 88 | 62 | 12 | 1 | 0 | 0.002 | 2 | 0.999 |
| **AR09** | 464 | 85 | 85 | 15 | 0 | 0 | 427 | 82 | 93 | 18 | 1 | 0 | 1.049 | 2 | 0.592 |
| **AR10** | 478 | 87 | 69 | 13 | 2 | 0 | 454 | 87 | 65 | 13 | 2 | 0 | 0.154 | 2 | 0.926 |
| **AR11** | 462 | 84 | 84 | 16 | 3 | 1 | 438 | 84 | 82 | 16 | 1 | 0 | 0.931 | 2 | 0.628 |
| **AR12** | 466 | 85 | 81 | 15 | 2 | 0 | 447 | 86 | 73 | 14 | 1 | 0 | 0.950 | 2 | 0.622 |
| **AR13** | 408 | 74 | 139 | 26 | 2 | 0 | 376 | 72 | 142 | 28 | 3 | 1 | 0.709 | 2 | 0.702 |
| **AR14** | 386 | 70 | 160 | 30 | 3 | 1 | 379 | 73 | 140 | 27 | 2 | 0 | 0.629 | 2 | 0.730 |
| **AR15** | 318 | 58 | 224 | 42 | 7 | 1 | 296 | 57 | 219 | 43 | 6 | 1 | 0.991 | 2 | 0.609 |
| **AR16** | 379 | 69 | 169 | 31 | 1 | 0 | 349 | 67 | 169 | 33 | 3 | 1 | 0.397 | 2 | 0.820 |
| **AR17** | 398 | 72 | 146 | 28 | 5 | 1 | 367 | 70 | 149 | 30 | 5 | 1 | 0.866 | 2 | 0.649 |
| **AR18** | 333 | 61 | 211 | 39 | 5 | 1 | 326 | 63 | 190 | 37 | 5 | 1 | 0.642 | 2 | 0.725 |
| **AR19** | 389 | 71 | 153 | 29 | 7 | 1 | 340 | 65 | 180 | 35 | 1 | 0 | 9.217 | 2 | 0.010 |
| **AR20** | 310 | 56 | 220 | 44 | 19 | 3 | 266 | 51 | 248 | 49 | 7 | 1 | 8.735 | 2 | 0.013 |
| **AR21** | 361 | 66 | 171 | 34 | 17 | 3 | 333 | 64 | 180 | 36 | 8 | 2 | 3.529 | 2 | 0.171 |
| **AR22*** | 238 | 43 | 281 | 57 | 30 | 5 | 258 | 50 | 254 | 50 | 9 | 2 | 12.021 | 2 | 0.002 |
| **AR23*** | 343 | 62 | 174 | 38 | 32 | 6 | 331 | 64 | 185 | 36 | 5 | 1 | 17.726 | 2 | 0.000 |
| **AR24*** | 258 | 47 | 242 | 53 | 49 | 9 | 248 | 48 | 254 | 52 | 19 | 4 | 12.368 | 2 | 0.002 |
| **AR25*** | 253 | 46 | 243 | 54 | 53 | 10 | 266 | 51 | 238 | 49 | 17 | 3 | 14.943 | 2 | 0.001 |

## Table F-7
## AR for male respondents

| | Web (N = 549) | | | | | | Paper (N =5 21) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | Pearson's | | |
| Question | # | % | # | % | # | % | # | % | # | % | # | % | Chi-2 | df | sig |
| **AR26*** | 228 | 42 | 251 | 58 | 70 | 13 | 235 | 45 | 262 | 55 | 24 | 5 | 19.727 | 2 | 0.000 |
| **AR27*** | 186 | 34 | 277 | 66 | 86 | 16 | 186 | 36 | 297 | 64 | 38 | 7 | 16.893 | 2 | 0.000 |
| **AR28*** | 304 | 55 | 153 | 45 | 92 | 17 | 294 | 56 | 195 | 44 | 32 | 6 | 31.151 | 2 | 0.000 |
| **AR29*** | 214 | 39 | 224 | 61 | 111 | 20 | 208 | 40 | 279 | 60 | 34 | 7 | 43.450 | 2 | 0.000 |
| **AR30*** | 124 | 23 | 306 | 77 | 119 | 22 | 147 | 28 | 333 | 72 | 41 | 8 | 37.943 | 2 | 0.000 |

* Significant difference between paper and web ($p < .01$).

## Table F-8
## AR for female respondents

| Question | Web (N = 111) | | | | | | Paper (N = 90) | | | | | | Pearson's Chi-2 | df | sig |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | | | |
| | # | % | # | % | # | % | # | % | # | % | # | % | | | |
| **AR01** | 108 | 98 | 2 | 2 | 1 | 1 | 89 | 99 | 1 | 1 | 0 | 0 | 0.444 | 1 | 0.505 |
| **AR02** | 105 | 95 | 6 | 5 | 0 | 0 | 88 | 98 | 2 | 2 | 0 | 0 | 1.318 | 1 | 0.251 |
| **AR03** | 102 | 93 | 8 | 7 | 1 | 1 | 87 | 97 | 3 | 3 | 0 | 0 | 2.294 | 2 | 0.318 |
| **AR04** | 97 | 87 | 14 | 13 | 0 | 0 | 76 | 84 | 14 | 16 | 0 | 0 | 0.359 | 1 | 0.549 |
| **AR05** | 88 | 80 | 22 | 20 | 1 | 1 | 72 | 81 | 17 | 19 | 1 | 1 | 0.048 | 2 | 0.977 |
| **AR06** | 83 | 75 | 27 | 25 | 1 | 1 | 77 | 86 | 13 | 14 | 0 | 0 | 3.974 | 2 | 0.137 |
| **AR07** | 97 | 88 | 13 | 12 | 1 | 1 | 78 | 87 | 12 | 13 | 0 | 0 | 0.919 | 2 | 0.632 |
| **AR08** | 97 | 87 | 14 | 13 | 0 | 0 | 77 | 86 | 13 | 14 | 0 | 0 | 0.143 | 1 | 0.705 |
| **AR09** | 83 | 76 | 26 | 24 | 2 | 2 | 72 | 80 | 18 | 20 | 0 | 0 | 2.064 | 2 | 0.356 |
| **AR10** | 81 | 74 | 29 | 26 | 1 | 1 | 72 | 80 | 18 | 20 | 0 | 0 | 1.931 | 2 | 0.381 |
| **AR11** | 89 | 80 | 22 | 20 | 0 | 0 | 75 | 83 | 15 | 17 | 0 | 0 | 0.329 | 1 | 0.566 |
| **AR12** | 84 | 76 | 27 | 24 | 0 | 0 | 78 | 87 | 12 | 13 | 0 | 0 | 3.839 | 1 | 0.050 |
| **AR13** | 74 | 68 | 35 | 32 | 2 | 2 | 62 | 69 | 28 | 31 | 0 | 0 | 1.661 | 2 | 0.436 |
| **AR14** | 64 | 59 | 44 | 41 | 3 | 3 | 68 | 76 | 22 | 24 | 0 | 0 | 8.352 | 2 | 0.015 |
| **AR15** | 63 | 58 | 45 | 42 | 3 | 3 | 55 | 62 | 34 | 38 | 1 | 1 | 0.890 | 2 | 0.641 |
| **AR16** | 63 | 57 | 47 | 43 | 1 | 1 | 56 | 62 | 34 | 38 | 0 | 0 | 1.319 | 2 | 0.517 |
| **AR17** | 72 | 65 | 39 | 35 | 0 | 0 | 53 | 60 | 36 | 40 | 1 | 1 | 1.834 | 2 | 0.400 |
| **AR18** | 53 | 48 | 58 | 52 | 0 | 0 | 51 | 57 | 39 | 43 | 0 | 0 | 1.583 | 1 | 0.208 |
| **AR19** | 57 | 52 | 52 | 48 | 2 | 2 | 52 | 58 | 38 | 42 | 0 | 0 | 2.238 | 2 | 0.327 |
| **AR20** | 61 | 56 | 47 | 44 | 3 | 3 | 46 | 52 | 43 | 48 | 1 | 1 | 1.099 | 2 | 0.577 |
| **AR21** | 67 | 63 | 39 | 37 | 5 | 5 | 58 | 64 | 32 | 36 | 0 | 0 | 4.190 | 2 | 0.123 |
| **AR22*** | 27 | 26 | 77 | 74 | 7 | 6 | 45 | 51 | 44 | 49 | 1 | 1 | 15.980 | 2 | 0.000 |
| **AR23** | 64 | 60 | 42 | 40 | 5 | 5 | 54 | 60 | 36 | 40 | 0 | 0 | 4.160 | 2 | 0.125 |
| **AR24** | 51 | 50 | 51 | 50 | 9 | 8 | 47 | 53 | 41 | 47 | 2 | 2 | 3.549 | 2 | 0.170 |

## Table F-8
## AR for female respondents

| Question | Web (N = 111) | | | | | | Paper (N = 90) | | | | | | Pearson's Chi-2 | df | sig |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | | | |
| | # | % | # | % | # | % | # | % | # | % | # | % | | | |
| **AR25** | 52 | 51 | 49 | 49 | 10 | 9 | 41 | 47 | 47 | 53 | 2 | 2 | 4.532 | 2 | 0.104 |
| **AR26** | 56 | 57 | 42 | 43 | 13 | 12 | 44 | 52 | 40 | 48 | 6 | 7 | 1.894 | 2 | 0.388 |
| **AR27** | 31 | 33 | 63 | 67 | 17 | 15 | 34 | 40 | 50 | 60 | 6 | 7 | 4.753 | 2 | 0.093 |
| **AR28** | 48 | 52 | 44 | 48 | 19 | 17 | 51 | 61 | 33 | 49 | 6 | 7 | 6.297 | 2 | 0.043 |
| **AR29** | 33 | 38 | 54 | 62 | 24 | 22 | 39 | 48 | 43 | 52 | 8 | 9 | 7.637 | 2 | 0.022 |
| **AR30** | 19 | 22 | 66 | 78 | 26 | 23 | 23 | 28 | 58 | 72 | 9 | 10 | 7.037 | 2 | 0.030 |

* Significant difference between paper and web ($p < .01$).

## Table F-9
## AR for majority respondents

| | Web (N = 351) | | | | | | Paper (N = 398) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | Pearson's | | |
| Question | # | % | # | % | # | % | # | % | # | % | # | % | Chi-2 | df | sig |
| **AR01** | 331 | 94 | 18 | 5 | 2 | 1 | 378 | 95 | 20 | 5 | 0 | 0 | 2.105 | 1 | 0.147 |
| **AR02** | 317 | 90 | 34 | 10 | 0 | 0 | 357 | 90 | 40 | 10 | 1 | 0 | 0.923 | 2 | 0.630 |
| **AR03** | 312 | 89 | 36 | 10 | 3 | 1 | 368 | 92 | 29 | 7 | 1 | 0 | 3.382 | 2 | 0.184 |
| **AR04** | 294 | 84 | 55 | 16 | 2 | 1 | 319 | 80 | 79 | 20 | 0 | 0 | 4.436 | 2 | 0.109 |
| **AR05** | 294 | 84 | 55 | 16 | 2 | 1 | 331 | 83 | 66 | 17 | 1 | 0 | 0.585 | 2 | 0.746 |
| **AR06** | 307 | 87 | 43 | 12 | 1 | 0 | 359 | 90 | 39 | 10 | 0 | 0 | 2.278 | 2 | 0.320 |
| **AR07** | 311 | 89 | 40 | 11 | 0 | 0 | 356 | 89 | 41 | 10 | 1 | 0 | 1.092 | 2 | 0.579 |
| **AR08** | 312 | 89 | 39 | 11 | 0 | 0 | 361 | 91 | 37 | 9 | 0 | 0 | 0.650 | 1 | 0.420 |
| **AR09** | 292 | 83 | 58 | 17 | 1 | 0 | 330 | 83 | 68 | 17 | 0 | 0 | 1.175 | 2 | 0.556 |
| **AR10** | 301 | 86 | 48 | 14 | 2 | 1 | 355 | 89 | 41 | 10 | 2 | 1 | 2.007 | 2 | 0.367 |
| **AR11** | 295 | 84 | 56 | 16 | 0 | 0 | 341 | 86 | 57 | 14 | 0 | 0 | 0.365 | 1 | 0.546 |
| **AR12** | 289 | 82 | 61 | 17 | 1 | 0 | 345 | 87 | 52 | 13 | 1 | 0 | 2.662 | 2 | 0.264 |
| **AR13** | 278 | 79 | 72 | 21 | 1 | 0 | 303 | 76 | 95 | 24 | 0 | 0 | 2.349 | 2 | 0.309 |
| **AR14** | 249 | 71 | 98 | 28 | 4 | 1 | 297 | 75 | 101 | 25 | 0 | 0 | 5.275 | 2 | 0.072 |
| **AR15** | 204 | 58 | 142 | 40 | 5 | 1 | 243 | 61 | 152 | 38 | 3 | 1 | 1.921 | 2 | 0.383 |
| **AR16** | 244 | 70 | 106 | 30 | 1 | 0 | 279 | 70 | 119 | 30 | 0 | 0 | 2.279 | 2 | 0.320 |
| **AR17** | 259 | 74 | 91 | 26 | 1 | 0 | 282 | 71 | 113 | 28 | 3 | 1 | 0.736 | 2 | 0.692 |
| **AR18** | 218 | 62 | 131 | 37 | 2 | 1 | 255 | 64 | 140 | 35 | 3 | 1 | 0.369 | 2 | 0.832 |
| **AR19** | 240 | 68 | 108 | 31 | 3 | 1 | 261 | 66 | 137 | 34 | 0 | 0 | 5.663 | 2 | 0.059 |
| **AR20*** | 215 | 61 | 125 | 36 | 11 | 3 | 204 | 51 | 190 | 48 | 4 | 1 | 14.440 | 2 | 0.001 |
| **AR21** | 230 | 66 | 113 | 32 | 8 | 2 | 268 | 67 | 124 | 31 | 6 | 2 | 1.189 | 2 | 0.552 |
| **AR22*** | 164 | 47 | 168 | 48 | 19 | 5 | 204 | 51 | 188 | 47 | 6 | 2 | 10.330 | 2 | 0.006 |
| **AR23*** | 222 | 63 | 109 | 31 | 20 | 6 | 260 | 65 | 137 | 34 | 1 | 0 | 21.606 | 2 | 0.000 |
| **AR24** | 170 | 48 | 156 | 44 | 25 | 7 | 202 | 51 | 185 | 46 | 11 | 3 | 8.503 | 2 | 0.014 |

## Table F-9
## AR for majority respondents

| Question | Web (N = 351) | | | | | | Paper (N = 398) | | | | | | Pearson's Chi-2 | df | sig |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | | | |
| | # | % | # | % | # | % | # | % | # | % | # | % | | | |
| **AR25*** | 175 | 50 | 148 | 42 | 28 | 8 | 204 | 51 | 186 | 47 | 8 | 2 | 15.093 | 2 | 0.001 |
| **AR26*** | 146 | 42 | 164 | 47 | 41 | 12 | 179 | 45 | 206 | 52 | 13 | 3 | 20.134 | 2 | 0.000 |
| **AR27*** | 129 | 37 | 172 | 49 | 50 | 14 | 155 | 39 | 220 | 55 | 23 | 6 | 15.819 | 2 | 0.000 |
| **AR28*** | 197 | 56 | 106 | 30 | 48 | 14 | 244 | 61 | 137 | 34 | 17 | 4 | 21.288 | 2 | 0.000 |
| **AR29*** | 137 | 39 | 149 | 42 | 65 | 19 | 175 | 44 | 205 | 52 | 18 | 5 | 37.605 | 2 | 0.000 |
| **AR30*** | 82 | 23 | 200 | 57 | 69 | 20 | 120 | 30 | 255 | 64 | 23 | 6 | 34.364 | 2 | 0.000 |

* Significant difference between paper and web ($p < .01$).

## Table F-10
## AR for minority respondents

| Question | Web (N = 218) | | | | | | Paper (N = 163) | | | | | | Pearson's Chi-2 | df | sig |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | | | |
| | # | % | # | % | # | % | # | % | # | % | # | % | | | |
| **AR01** | 211 | 97 | 6 | 3 | 1 | 0 | 149 | 91 | 14 | 9 | 0 | 0 | 1.833 | 1 | 0.176 |
| **AR02** | 209 | 96 | 8 | 4 | 1 | 0 | 149 | 91 | 14 | 9 | 0 | 0 | 4.636 | 2 | 0.098 |
| **AR03** | 200 | 92 | 18 | 8 | 0 | 0 | 151 | 93 | 12 | 7 | 0 | 0 | 0.267 | 1 | 0.605 |
| **AR04** | 188 | 87 | 29 | 13 | 1 | 0 | 134 | 82 | 29 | 18 | 0 | 0 | 2.037 | 2 | 0.361 |
| **AR05** | 175 | 81 | 41 | 19 | 2 | 1 | 121 | 74 | 42 | 26 | 0 | 0 | 3.801 | 2 | 0.149 |
| **AR06** | 182 | 84 | 35 | 16 | 1 | 0 | 134 | 83 | 28 | 17 | 1 | 1 | 0.114 | 2 | 0.945 |
| **AR07** | 194 | 89 | 23 | 11 | 1 | 0 | 130 | 80 | 33 | 20 | 0 | 0 | 6.630 | 2 | 0.036 |
| **AR08** | 188 | 87 | 29 | 13 | 1 | 0 | 129 | 79 | 34 | 21 | 0 | 0 | 4.871 | 2 | 0.088 |
| **AR09** | 181 | 83 | 36 | 17 | 1 | 0 | 127 | 78 | 36 | 22 | 0 | 0 | 2.121 | 2 | 0.346 |
| **AR10** | 181 | 83 | 36 | 17 | 1 | 0 | 129 | 79 | 34 | 21 | 0 | 0 | 1.807 | 2 | 0.405 |
| **AR11** | 182 | 84 | 35 | 16 | 1 | 0 | 127 | 78 | 36 | 22 | 0 | 0 | 2.416 | 2 | 0.299 |
| **AR12** | 181 | 83 | 36 | 17 | 1 | 0 | 139 | 85 | 24 | 15 | 0 | 0 | 0.909 | 2 | 0.635 |
| **AR13** | 141 | 65 | 75 | 35 | 2 | 1 | 100 | 63 | 60 | 37 | 3 | 0 | 0.920 | 2 | 0.631 |
| **AR14** | 145 | 67 | 71 | 33 | 2 | 1 | 114 | 70 | 48 | 30 | 1 | 1 | 0.427 | 2 | 0.808 |
| **AR15** | 124 | 58 | 89 | 42 | 5 | 2 | 80 | 50 | 81 | 50 | 2 | 1 | 3.622 | 2 | 0.163 |
| **AR16** | 134 | 62 | 83 | 38 | 1 | 0 | 97 | 60 | 64 | 40 | 2 | 1 | 0.629 | 2 | 0.730 |
| **AR17** | 145 | 68 | 69 | 32 | 4 | 2 | 104 | 65 | 56 | 35 | 3 | 2 | 0.365 | 2 | 0.833 |
| **AR18** | 11 | 5 | 105 | 95 | 2 | 1 | 89 | 55 | 73 | 45 | 1 | 1 | 0.476 | 2 | 0.788 |
| **AR19** | 140 | 66 | 73 | 34 | 5 | 2 | 93 | 57 | 69 | 43 | 1 | 1 | 3.310 | 2 | 0.191 |
| **AR20** | 111 | 53 | 98 | 47 | 9 | 4 | 87 | 54 | 73 | 46 | 3 | 2 | 0.697 | 2 | 0.706 |
| **AR21*** | 143 | 69 | 64 | 31 | 11 | 5 | 90 | 56 | 71 | 44 | 2 | 1 | 9.409 | 2 | 0.009 |
| **AR22*** | 65 | 32 | 140 | 68 | 13 | 6 | 78 | 49 | 82 | 51 | 3 | 2 | 13.742 | 2 | 0.001 |
| **AR23** | 130 | 64 | 74 | 36 | 14 | 6 | 96 | 60 | 65 | 40 | 2 | 1 | 4.734 | 2 | 0.094 |
| **AR24** | 97 | 50 | 98 | 50 | 23 | 10 | 72 | 46 | 85 | 54 | 6 | 4 | 5.285 | 2 | 0.071 |
| **AR25** | 91 | 47 | 103 | 53 | 24 | 10 | 76 | 49 | 79 | 51 | 8 | 5 | 2.712 | 2 | 0.258 |

## Table F-10
## AR for minority respondents

| Question | Web (N = 218) | | | | | | Paper (N = 163) | | | | | | Pearson's Chi-2 | df | sig |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | | | |
| | # | % | # | % | # | % | # | % | # | % | # | % | | | |
| **AR26** | 94 | 49 | 97 | 51 | 27 | 12 | 79 | 53 | 71 | 47 | 13 | 8 | 1.326 | 2 | 0.515 |
| **AR27** | 64 | 35 | 119 | 65 | 35 | 16 | 46 | 31 | 101 | 69 | 16 | 10 | 2.423 | 2 | 0.298 |
| **AR28*** | 105 | 60 | 69 | 40 | 44 | 20 | 69 | 47 | 78 | 53 | 16 | 10 | 11.483 | 2 | 0.003 |
| **AR29** | 80 | 47 | 90 | 53 | 48 | 22 | 59 | 41 | 85 | 59 | 19 | 12 | 6.408 | 2 | 0.041 |
| **AR30** | 46 | 28 | 118 | 72 | 54 | 24 | 37 | 26 | 104 | 64 | 22 | 13 | 5.925 | 2 | 0.052 |

* Significant difference between paper and web ($p < .01$).

## Table F-11
## WK for all respondents

| Question | Web (N = 741) | | | | | | Paper (N = 650) | | | | | | Pearson's Chi-2 | df | sig |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | | | |
| | # | % | # | % | # | % | # | % | # | % | # | % | | | |
| **WK01*** | 727 | 98 | 10 | 2 | 4 | 0 | 629 | 97 | 21 | 3 | 0 | 0 | 10.812 | 2 | 0.004 |
| **WK02*** | 729 | 98 | 11 | 2 | 1 | 0 | 636 | 98 | 14 | 2 | 0 | 0 | 10.700 | 2 | 0.005 |
| **WK03*** | 734 | 99 | 5 | 1 | 2 | 0 | 635 | 98 | 13 | 2 | 2 | 0 | 15.109 | 2 | 0.001 |
| **WK04*** | 697 | 94 | 44 | 6 | 0 | 0 | 618 | 95 | 32 | 5 | 0 | 0 | 12.304 | 2 | 0.002 |
| **WK05*** | 725 | 98 | 15 | 2 | 1 | 0 | 628 | 97 | 22 | 3 | 0 | 0 | 11.877 | 2 | 0.003 |
| **WK06** | 727 | 98 | 11 | 2 | 3 | 0 | 636 | 98 | 14 | 2 | 0 | 0 | 7.129 | 2 | 0.028 |
| **WK07*** | 731 | 99 | 9 | 1 | 1 | 0 | 634 | 98 | 16 | 2 | 0 | 0 | 13.104 | 2 | 0.001 |
| **WK08*** | 733 | 99 | 8 | 1 | 0 | 0 | 627 | 96 | 23 | 4 | 0 | 0 | 22.245 | 2 | 0.000 |
| **WK09*** | 697 | 94 | 43 | 6 | 1 | 0 | 618 | 95 | 32 | 5 | 0 | 0 | 9.822 | 2 | 0.007 |
| **WK10*** | 735 | 99 | 5 | 1 | 1 | 0 | 637 | 98 | 13 | 2 | 0 | 0 | 15.018 | 2 | 0.001 |
| **WK11*** | 734 | 99 | 6 | 1 | 1 | 0 | 640 | 98 | 10 | 2 | 0 | 0 | 11.652 | 2 | 0.003 |
| **WK12** | 711 | 96 | 27 | 4 | 3 | 0 | 628 | 97 | 22 | 3 | 0 | 0 | 5.908 | 2 | 0.052 |
| **WK13** | 636 | 86 | 100 | 14 | 5 | 1 | 577 | 89 | 71 | 11 | 2 | 0 | 6.992 | 2 | 0.030 |
| **WK14*** | 623 | 84 | 118 | 16 | 0 | 0 | 549 | 84 | 100 | 16 | 1 | 0 | 12.956 | 2 | 0.002 |
| **WK15** | 727 | 98 | 12 | 2 | 2 | 0 | 640 | 98 | 9 | 2 | 1 | 0 | 8.519 | 2 | 0.014 |
| **WK16*** | 706 | 95 | 33 | 5 | 2 | 0 | 631 | 97 | 18 | 3 | 1 | 0 | 12.328 | 2 | 0.002 |
| **WK17*** | 694 | 94 | 45 | 6 | 2 | 0 | 608 | 94 | 40 | 6 | 2 | 0 | 10.554 | 2 | 0.005 |
| **WK18*** | 644 | 87 | 96 | 13 | 1 | 0 | 580 | 89 | 70 | 11 | 0 | 0 | 12.134 | 2 | 0.002 |
| **WK19*** | 653 | 88 | 88 | 12 | 0 | 0 | 582 | 90 | 66 | 10 | 2 | 0 | 16.178 | 2 | 0.000 |
| **WK20*** | 661 | 89 | 80 | 11 | 0 | 0 | 585 | 90 | 63 | 10 | 2 | 0 | 15.500 | 2 | 0.000 |
| **WK21*** | 651 | 88 | 89 | 12 | 1 | 0 | 575 | 88 | 74 | 12 | 1 | 0 | 11.729 | 2 | 0.003 |
| **WK22** | 634 | 86 | 104 | 14 | 3 | 0 | 569 | 88 | 80 | 12 | 1 | 0 | 8.713 | 2 | 0.013 |
| **WK23*** | 648 | 87 | 90 | 13 | 3 | 0 | 582 | 90 | 65 | 10 | 3 | 0 | 11.332 | 3 | 0.003 |
| **WK24*** | 658 | 89 | 82 | 11 | 1 | 0 | 591 | 91 | 58 | 9 | 1 | 0 | 13.366 | 2 | 0.001 |

## Table F-11
## WK for all respondents

| Question | Web (N = 741) | | | | | | Paper (N = 650) | | | | | | Pearson's Chi-2 | df | sig |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | | | |
| | # | % | # | % | # | % | # | % | # | % | # | % | | | |
| **WK25*** | 482 | 65 | 257 | 35 | 2 | 0 | 430 | 66 | 214 | 34 | 6 | 1 | 15.172 | 2 | 0.001 |
| **WK26** | 581 | 78 | 155 | 22 | 5 | 1 | 512 | 79 | 134 | 21 | 4 | 0 | 7.563 | 2 | 0.023 |
| **WK27*** | 667 | 90 | 71 | 10 | 3 | 0 | 577 | 89 | 67 | 11 | 6 | 1 | 12.974 | 2 | 0.002 |
| **WK28** | 633 | 85 | 102 | 15 | 6 | 1 | 575 | 88 | 74 | 12 | 1 | 0 | 5.853 | 2 | 0.054 |
| **WK29** | 471 | 64 | 266 | 36 | 4 | 0 | 427 | 66 | 220 | 34 | 3 | 0 | 8.683 | 2 | 0.013 |
| **WK30** | 522 | 70 | 212 | 30 | 7 | 1 | 464 | 71 | 184 | 29 | 2 | 0 | 3.715 | 2 | 0.156 |
| **WK31** | 466 | 63 | 265 | 37 | 10 | 1 | 384 | 59 | 257 | 41 | 9 | 1 | 8.044 | 2 | 0.018 |
| **WK32** | 394 | 53 | 336 | 47 | 11 | 1 | 345 | 53 | 299 | 47 | 6 | 1 | 3.082 | 2 | 0.214 |
| **WK33** | 183 | 25 | 546 | 75 | 12 | 1 | 176 | 27 | 467 | 73 | 7 | 1 | 3.936 | 2 | 0.140 |
| **WK34** | 401 | 54 | 331 | 46 | 9 | 1 | 391 | 60 | 255 | 40 | 4 | 0 | 8.049 | 2 | 0.018 |
| **WK35** | 393 | 53 | 331 | 47 | 17 | 2 | 327 | 50 | 315 | 50 | 8 | 1 | 2.460 | 2 | 0.292 |

* Significant difference between paper and web ($p < .01$).

## Table F-12
## WK for male respondents

| Question | Web (N = 551) | | | | | | Paper (N = 515) | | | | | | Pearson's Chi-2 | df | sig |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | | | |
| | # | % | # | % | # | % | # | % | # | % | # | % | | | |
| **WK01** | 542 | 98 | 8 | 2 | 1 | 0 | 499 | 97 | 16 | 3 | 0 | 0 | 9.105 | 2 | 0.011 |
| **WK02** | 541 | 98 | 9 | 2 | 1 | 0 | 503 | 98 | 12 | 2 | 0 | 0 | 6.472 | 2 | 0.039 |
| **WK03*** | 546 | 99 | 4 | 1 | 1 | 0 | 500 | 97 | 13 | 3 | 2 | 0 | 13.262 | 2 | 0.001 |
| **WK04** | 519 | 94 | 32 | 6 | 0 | 0 | 486 | 94 | 29 | 6 | 0 | 0 | 7.923 | 2 | 0.019 |
| **WK05** | 537 | 97 | 13 | 3 | 1 | 0 | 498 | 97 | 17 | 3 | 0 | 0 | 6.664 | 2 | 0.036 |
| **WK06** | 541 | 98 | 7 | 2 | 3 | 1 | 503 | 98 | 12 | 2 | 0 | 0 | 4.596 | 2 | 0.100 |
| **WK07** | 542 | 98 | 8 | 2 | 1 | 0 | 50 | 10 | 465 | 23 | 0 | 0 | 8.485 | 2 | 0.014 |
| **WK08*** | 546 | 99 | 5 | 1 | 0 | 0 | 499 | 97 | 16 | 3 | 0 | 0 | 14.572 | 2 | 0.001 |
| **WK09** | 520 | 94 | 30 | 6 | 1 | 0 | 492 | 96 | 23 | 4 | 0 | 0 | 6.360 | 2 | 0.042 |
| **WK10** | 545 | 99 | 5 | 1 | 1 | 0 | 503 | 98 | 12 | 2 | 0 | 0 | 9.228 | 2 | 0.010 |
| **WK11** | 545 | 99 | 5 | 1 | 1 | 0 | 506 | 98 | 9 | 2 | 0 | 0 | 7.251 | 2 | 0.027 |
| **WK12** | 530 | 96 | 20 | 4 | 1 | 0 | 495 | 96 | 20 | 4 | 0 | 0 | 5.855 | 2 | 0.054 |
| **WK13** | 475 | 86 | 73 | 14 | 3 | 1 | 458 | 89 | 55 | 11 | 2 | 0 | 6.168 | 2 | 0.046 |
| **WK14** | 465 | 84 | 86 | 16 | 0 | 0 | 439 | 85 | 75 | 15 | 1 | 0 | 9.162 | 2 | 0.010 |
| **WK15** | 544 | 99 | 7 | 1 | 0 | 0 | 507 | 98 | 8 | 2 | 0 | 0 | 8.061 | 2 | 0.018 |
| **WK16** | 528 | 96 | 21 | 4 | 2 | 0 | 498 | 97 | 16 | 3 | 1 | 0 | 5.451 | 2 | 0.066 |
| **WK17** | 512 | 93 | 37 | 7 | 2 | 0 | 481 | 93 | 33 | 7 | 1 | 0 | 5.094 | 2 | 0.078 |
| **WK18** | 482 | 87 | 69 | 13 | 0 | 0 | 456 | 89 | 59 | 11 | 0 | 0 | 8.194 | 2 | 0.017 |
| **WK19*** | 494 | 90 | 57 | 10 | 0 | 0 | 470 | 91 | 43 | 9 | 2 | 0 | 11.195 | 2 | 0.004 |
| **WK20*** | 499 | 91 | 52 | 9 | 0 | 0 | 463 | 90 | 50 | 10 | 2 | 0 | 10.024 | 2 | 0.007 |
| **WK21** | 494 | 90 | 56 | 10 | 1 | 0 | 463 | 90 | 52 | 10 | 0 | 0 | 5.812 | 2 | 0.055 |
| **WK22** | 475 | 86 | 75 | 14 | 1 | 0 | 454 | 88 | 61 | 12 | 0 | 0 | 6.576 | 2 | 0.037 |
| **WK23** | 485 | 88 | 63 | 12 | 3 | 1 | 463 | 90 | 50 | 10 | 2 | 0 | 5.333 | 2 | 0.070 |
| **WK24** | 499 | 91 | 51 | 9 | 1 | 0 | 477 | 93 | 38 | 7 | 0 | 0 | 7.056 | 2 | 0.029 |

## Table F-12
## WK for male respondents

| Question | Web (N = 551) | | | | | | Paper (N = 515) | | | | | | Pearson's Chi-2 | df | sig |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | | | |
| | # | % | # | % | # | % | # | % | # | % | # | % | | | |
| **WK25** | 364 | 66 | 185 | 34 | 2 | 0 | 338 | 66 | 173 | 34 | 4 | 1 | 7.811 | 2 | 0.020 |
| **WK26** | 454 | 82 | 95 | 18 | 2 | 0 | 415 | 81 | 97 | 19 | 3 | 1 | 7.349 | 2 | 0.025 |
| **WK27*** | 503 | 91 | 47 | 9 | 1 | 0 | 460 | 89 | 52 | 11 | 3 | 1 | 9.568 | 2 | 0.008 |
| **WK28** | 476 | 86 | 70 | 14 | 5 | 1 | 462 | 90 | 53 | 10 | 0 | 0 | 2.883 | 2 | 0.237 |
| **WK29** | 366 | 66 | 183 | 34 | 2 | 0 | 345 | 67 | 169 | 33 | 1 | 0 | 5.075 | 2 | 0.079 |
| **WK30** | 409 | 74 | 137 | 26 | 5 | 1 | 386 | 75 | 129 | 25 | 0 | 0 | 1.230 | 2 | 0.541 |
| **WK31** | 348 | 63 | 194 | 37 | 9 | 2 | 300 | 58 | 210 | 42 | 5 | 1 | 4.515 | 2 | 0.105 |
| **WK32** | 305 | 55 | 238 | 45 | 8 | 1 | 277 | 54 | 236 | 46 | 2 | 0 | 1.108 | 2 | 0.575 |
| **WK33** | 138 | 25 | 403 | 75 | 10 | 2 | 143 | 28 | 369 | 72 | 3 | 1 | 1.077 | 2 | 0.584 |
| **WK34** | 300 | 54 | 243 | 46 | 8 | 1 | 315 | 61 | 199 | 39 | 1 | 0 | 4.272 | 2 | 0.118 |
| **WK35** | 296 | 54 | 240 | 46 | 15 | 3 | 264 | 51 | 247 | 49 | 4 | 1 | 1.387 | 2 | 0.500 |

* Significant difference between paper and web ($p < .01$).

## Table F-13
## WK for female respondents

| Question | Web (N = 111) | | | | | | Paper (N = 87) | | | | | | Pearson's Chi-2 | df | sig |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | | | |
| | # | % | # | % | # | % | # | % | # | % | # | % | | | |
| **WK01** | 106 | 98 | 2 | 2 | 3 | 3 | 85 | 98 | 2 | 2 | 0 | 0 | 0.521 | 2 | 0.771 |
| **WK02** | 109 | 98 | 2 | 2 | 0 | 0 | 85 | 98 | 2 | 2 | 0 | 0 | 3.008 | 2 | 0.222 |
| **WK03** | 109 | 99 | 1 | 1 | 1 | 1 | 87 | 100 | 0 | 0 | 0 | 0 | 0.615 | 2 | 0.735 |
| **WK04** | 105 | 95 | 6 | 5 | 0 | 0 | 86 | 99 | 1 | 1 | 0 | 0 | 3.737 | 2 | 0.154 |
| **WK05** | 110 | 99 | 1 | 1 | 0 | 0 | 84 | 97 | 3 | 3 | 0 | 0 | 4.055 | 2 | 0.132 |
| **WK06** | 109 | 98 | 2 | 2 | 0 | 0 | 86 | 99 | 1 | 1 | 0 | 0 | 2.547 | 2 | 0.280 |
| **WK07** | 111 | 100 | 0 | 0 | 0 | 0 | 86 | 99 | 1 | 1 | 0 | 0 | 5.034 | 2 | 0.081 |
| **WK08** | 110 | 99 | 1 | 1 | 0 | 0 | 86 | 99 | 1 | 1 | 0 | 0 | 7.543 | 2 | 0.023 |
| **WK09** | 108 | 97 | 3 | 3 | 0 | 0 | 82 | 94 | 5 | 6 | 0 | 0 | 3.618 | 2 | 0.164 |
| **WK10** | 111 | 100 | 0 | 0 | 0 | 0 | 83 | 95 | 4 | 5 | 0 | 0 | 5.034 | 2 | 0.081 |
| **WK11** | 110 | 99 | 1 | 1 | 0 | 0 | 86 | 99 | 1 | 1 | 0 | 0 | 2.519 | 2 | 0.284 |
| **WK12** | 103 | 94 | 6 | 6 | 2 | 2 | 87 | 100 | 0 | 0 | 0 | 0 | 1.350 | 2 | 0.509 |
| **WK13** | 96 | 87 | 14 | 13 | 1 | 1 | 86 | 99 | 1 | 1 | 0 | 0 | 0.675 | 2 | 0.713 |
| **WK14** | 90 | 81 | 21 | 19 | 0 | 0 | 78 | 90 | 9 | 10 | 0 | 0 | 3.086 | 2 | 0.214 |
| **WK15** | 105 | 96 | 4 | 4 | 2 | 2 | 75 | 87 | 11 | 13 | 1 | 1 | 0.786 | 2 | 0.675 |
| **WK16** | 103 | 93 | 8 | 7 | 0 | 0 | 85 | 98 | 2 | 2 | 0 | 0 | 6.197 | 2 | 0.045 |
| **WK17** | 107 | 96 | 4 | 4 | 0 | 0 | 85 | 98 | 2 | 2 | 0 | 0 | 4.038 | 2 | 0.133 |
| **WK18** | 93 | 85 | 17 | 15 | 1 | 1 | 80 | 92 | 7 | 8 | 0 | 0 | 3.993 | 2 | 0.136 |
| **WK19** | 92 | 83 | 19 | 17 | 0 | 0 | 75 | 86 | 12 | 14 | 0 | 0 | 4.163 | 2 | 0.125 |
| **WK20** | 97 | 87 | 14 | 13 | 0 | 0 | 77 | 89 | 10 | 11 | 0 | 0 | 3.813 | 2 | 0.149 |
| **WK21** | 90 | 81 | 21 | 19 | 0 | 0 | 72 | 84 | 14 | 16 | 1 | 1 | 5.263 | 2 | 0.072 |
| **WK22** | 87 | 80 | 22 | 20 | 2 | 2 | 76 | 87 | 11 | 13 | 0 | 0 | 2.442 | 2 | 0.295 |
| **WK23** | 97 | 87 | 14 | 13 | 0 | 0 | 82 | 94 | 5 | 6 | 0 | 0 | 6.396 | 2 | 0.041 |
| **WK24** | 88 | 79 | 23 | 21 | 0 | 0 | 77 | 89 | 10 | 11 | 0 | 0 | 6.734 | 2 | 0.034 |

## Table F-13
## WK for female respondents

| Question | Web (N = 111) | | | | | | Paper (N = 87) | | | | | | Pearson's Chi-2 | df | sig |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | | | |
| | # | % | # | % | # | % | # | % | # | % | # | % | | | |
| **WK25*** | 63 | 57 | 48 | 43 | 0 | 0 | 65 | 75 | 22 | 25 | 0 | 0 | 10.610 | 2 | 0.005 |
| **WK26** | 71 | 65 | 39 | 35 | 1 | 1 | 60 | 69 | 27 | 31 | 0 | 0 | 1.933 | 2 | 0.380 |
| **WK27** | 97 | 88 | 13 | 12 | 1 | 1 | 79 | 93 | 6 | 7 | 2 | 2 | 4.946 | 2 | 0.084 |
| **WK28** | 91 | 82 | 20 | 18 | 0 | 0 | 76 | 87 | 11 | 13 | 0 | 0 | 4.819 | 2 | 0.090 |
| **WK29** | 60 | 54 | 51 | 46 | 0 | 0 | 55 | 63 | 32 | 37 | 0 | 0 | 5.432 | 2 | 0.066 |
| **WK30** | 64 | 58 | 46 | 42 | 1 | 1 | 53 | 61 | 34 | 47 | 0 | 0 | 1.658 | 2 | 0.436 |
| **WK31** | 68 | 61 | 43 | 39 | 0 | 0 | 63 | 72 | 24 | 37 | 0 | 0 | 6.455 | 2 | 0.040 |
| **WK32** | 53 | 49 | 56 | 51 | 2 | 2 | 51 | 59 | 36 | 41 | 0 | 0 | 2.419 | 2 | 0.298 |
| **WK33** | 29 | 26 | 81 | 74 | 1 | 1 | 22 | 25 | 65 | 75 | 0 | 0 | 1.537 | 2 | 0.464 |
| **WK34** | 60 | 55 | 50 | 45 | 1 | 1 | 54 | 62 | 33 | 38 | 0 | 0 | 2.632 | 2 | 0.268 |
| **WK35** | 61 | 55 | 49 | 45 | 1 | 1 | 46 | 53 | 40 | 47 | 1 | 1 | 2.648 | 2 | 0.266 |

* Significant difference between paper and web ($p < .01$).

## Table F-14
## WK for majority respondents

| Question | Web (N = 352) | | | | | | Paper (N = 394) | | | | | | Pearson's Chi-2 | df | sig |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | | | |
| | # | % | # | % | # | % | # | % | # | % | # | % | | | |
| **WK01** | 348 | 99 | 4 | 1 | 0 | 0 | 383 | 97 | 11 | 3 | 0 | 0 | 4.813 | 2 | 0.090 |
| **WK02** | 347 | 99 | 5 | 1 | 0 | 0 | 389 | 99 | 5 | 1 | 0 | 0 | 2.258 | 2 | 0.323 |
| **WK03** | 347 | 99 | 3 | 1 | 2 | 1 | 382 | 97 | 12 | 3 | 0 | 0 | 4.252 | 2 | 0.119 |
| **WK04** | 339 | 96 | 13 | 4 | 0 | 0 | 375 | 95 | 19 | 5 | 0 | 0 | 2.803 | 2 | 0.246 |
| **WK05** | 348 | 99 | 4 | 1 | 0 | 0 | 384 | 97 | 8 | 2 | 2 | 1 | 4.211 | 2 | 0.122 |
| **WK06** | 348 | 99 | 4 | 1 | 0 | 0 | 385 | 98 | 9 | 2 | 0 | 0 | 3.657 | 2 | 0.161 |
| **WK07** | 347 | 99 | 4 | 1 | 1 | 0 | 382 | 97 | 12 | 3 | 0 | 0 | 4.168 | 2 | 0.124 |
| **WK08** | 350 | 99 | 2 | 1 | 0 | 0 | 382 | 97 | 12 | 3 | 0 | 0 | 8.426 | 2 | 0.015 |
| **WK09** | 344 | 98 | 7 | 2 | 1 | 0 | 383 | 97 | 11 | 3 | 0 | 0 | 1.458 | 2 | 0.482 |
| **WK10** | 350 | 99 | 1 | 0 | 1 | 0 | 385 | 98 | 9 | 2 | 0 | 0 | 6.563 | 2 | 0.038 |
| **WK11** | 348 | 99 | 3 | 1 | 1 | 0 | 389 | 99 | 5 | 1 | 0 | 0 | 1.257 | 2 | 0.533 |
| **WK12** | 344 | 98 | 8 | 2 | 0 | 0 | 381 | 97 | 13 | 3 | 0 | 0 | 2.943 | 2 | 0.230 |
| **WK13** | 319 | 91 | 31 | 9 | 2 | 1 | 369 | 94 | 25 | 6 | 0 | 0 | 2.721 | 2 | 0.257 |
| **WK14** | 308 | 88 | 44 | 13 | 0 | 0 | 350 | 89 | 44 | 11 | 0 | 0 | 2.543 | 2 | 0.280 |
| **WK15** | 351 | 99 | 1 | 0 | 0 | 0 | 388 | 98 | 5 | 1 | 1 | 0 | 5.297 | 2 | 0.071 |
| **WK16** | 340 | 97 | 11 | 3 | 1 | 0 | 384 | 97 | 10 | 3 | 0 | 0 | 1.198 | 2 | 0.549 |
| **WK17** | 336 | 95 | 15 | 4 | 1 | 0 | 377 | 96 | 17 | 4 | 0 | 0 | 0.958 | 2 | 0.619 |
| **WK18** | 313 | 89 | 39 | 11 | 0 | 0 | 371 | 94 | 23 | 6 | 0 | 0 | 8.933 | 2 | 0.011 |
| **WK19** | 328 | 93 | 24 | 7 | 0 | 0 | 370 | 94 | 24 | 6 | 0 | 0 | 2.389 | 2 | 0.303 |
| **WK20** | 323 | 92 | 29 | 8 | 0 | 0 | 363 | 92 | 31 | 8 | 0 | 0 | 3.119 | 2 | 0.210 |
| **WK21** | 314 | 89 | 37 | 11 | 1 | 0 | 358 | 91 | 36 | 9 | 0 | 0 | 1.372 | 2 | 0.504 |
| **WK22** | 315 | 89 | 36 | 10 | 1 | 0 | 363 | 92 | 30 | 8 | 1 | 0 | 2.252 | 2 | 0.324 |
| **WK23** | 326 | 93 | 25 | 7 | 1 | 0 | 365 | 93 | 29 | 7 | 0 | 0 | 1.563 | 2 | 0.458 |
| **WK24** | 324 | 92 | 27 | 8 | 1 | 0 | 374 | 95 | 20 | 5 | 0 | 0 | 3.108 | 2 | 0.211 |

## Table F-14
## WK for majority respondents

| Question | Web (N = 352) | | | | | | Paper (N = 394) | | | | | | Pearson's Chi-2 | df | sig |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | | | |
| | # | % | # | % | # | % | # | % | # | % | # | % | | | |
| **WK25** | 234 | 66 | 116 | 33 | 2 | 1 | 264 | 67 | 129 | 33 | 1 | 0 | 1.188 | 2 | 0.552 |
| **WK26** | 309 | 88 | 43 | 12 | 0 | 0 | 339 | 86 | 55 | 14 | 0 | 0 | 3.407 | 2 | 0.182 |
| **WK27** | 323 | 92 | 29 | 8 | 0 | 0 | 354 | 90 | 38 | 10 | 2 | 1 | 5.039 | 2 | 0.081 |
| **WK28** | 311 | 88 | 40 | 11 | 1 | 0 | 356 | 90 | 37 | 9 | 1 | 0 | 1.565 | 2 | 0.457 |
| **WK29** | 244 | 69 | 108 | 31 | 0 | 0 | 277 | 70 | 114 | 29 | 3 | 1 | 2.312 | 2 | 0.315 |
| **WK30** | 279 | 79 | 71 | 20 | 2 | 1 | 301 | 76 | 93 | 24 | 0 | 0 | 1.477 | 2 | 0.478 |
| **WK31** | 225 | 64 | 125 | 36 | 2 | 1 | 241 | 61 | 153 | 39 | 0 | 0 | 2.848 | 2 | 0.241 |
| **WK32** | 206 | 59 | 144 | 41 | 2 | 1 | 219 | 56 | 175 | 44 | 0 | 0 | 1.419 | 2 | 0.492 |
| **WK33** | 97 | 28 | 253 | 72 | 2 | 1 | 121 | 31 | 269 | 68 | 4 | 1 | 2.664 | 2 | 0.264 |
| **WK34** | 202 | 57 | 149 | 42 | 1 | 0 | 236 | 60 | 157 | 40 | 1 | 0 | 2.042 | 2 | 0.360 |
| **WK35** | 204 | 58 | 144 | 41 | 4 | 1 | 210 | 53 | 181 | 46 | 3 | 1 | 2.186 | 2 | 0.335 |

## Table F-15
## WK for minority respondents

| Question | Web (N = 219) | | | | | | Paper (N = 159) | | | | | | Pearson's Chi-2 | df | sig |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | | | |
| | # | % | # | % | # | % | # | % | # | % | # | % | | | |
| **WK01** | 211 | 97 | 6 | 3 | 2 | 1 | 151 | 95 | 8 | 5 | 0 | 0 | 5.822 | 2 | 0.054 |
| **WK02** | 212 | 97 | 6 | 3 | 1 | 0 | 152 | 96 | 7 | 4 | 0 | 0 | 7.309 | 2 | 0.026 |
| **WK03*** | 217 | 99 | 2 | 1 | 0 | 0 | 156 | 98 | 3 | 2 | 0 | 0 | 10.071 | 2 | 0.007 |
| **WK04*** | 197 | 90 | 22 | 10 | 0 | 0 | 150 | 94 | 9 | 6 | 0 | 0 | 11.744 | 2 | 0.003 |
| **WK05** | 210 | 96 | 8 | 4 | 1 | 0 | 152 | 96 | 7 | 4 | 0 | 0 | 6.690 | 2 | 0.035 |
| **WK06** | 212 | 98 | 5 | 2 | 2 | 1 | 155 | 97 | 4 | 3 | 0 | 0 | 4.532 | 2 | 0.104 |
| **WK07*** | 216 | 99 | 3 | 1 | 0 | 0 | 157 | 99 | 2 | 1 | 0 | 0 | 9.415 | 2 | 0.009 |
| **WK08*** | 217 | 99 | 2 | 1 | 0 | 0 | 152 | 96 | 7 | 4 | 0 | 0 | 14.201 | 2 | 0.001 |
| **WK09*** | 197 | 90 | 22 | 10 | 0 | 0 | 145 | 91 | 14 | 9 | 0 | 0 | 9.569 | 2 | 0.008 |
| **WK10*** | 215 | 98 | 4 | 2 | 0 | 0 | 156 | 98 | 3 | 2 | 0 | 0 | 9.408 | 2 | 0.009 |
| **WK11*** | 216 | 99 | 3 | 1 | 0 | 0 | 155 | 97 | 4 | 3 | 0 | 0 | 10.067 | 2 | 0.007 |
| **WK12** | 200 | 92 | 17 | 8 | 2 | 1 | 153 | 96 | 6 | 4 | 0 | 0 | 7.136 | 2 | 0.028 |
| **WK13** | 170 | 78 | 47 | 22 | 2 | 1 | 125 | 79 | 34 | 21 | 0 | 0 | 4.518 | 2 | 0.104 |
| **WK14*** | 169 | 77 | 50 | 23 | 0 | 0 | 126 | 80 | 32 | 20 | 1 | 1 | 11.134 | 2 | 0.004 |
| **WK15*** | 209 | 96 | 9 | 4 | 1 | 0 | 156 | 99 | 2 | 1 | 1 | 1 | 10.498 | 2 | 0.005 |
| **WK16*** | 202 | 92 | 17 | 8 | 0 | 0 | 152 | 96 | 7 | 4 | 0 | 0 | 11.144 | 2 | 0.004 |
| **WK17** | 196 | 90 | 22 | 10 | 1 | 0 | 146 | 92 | 13 | 8 | 0 | 0 | 6.960 | 2 | 0.031 |
| **WK18** | 186 | 85 | 32 | 15 | 1 | 0 | 126 | 79 | 33 | 21 | 0 | 0 | 8.927 | 2 | 0.012 |
| **WK19*** | 174 | 79 | 45 | 21 | 0 | 0 | 136 | 86 | 22 | 14 | 1 | 1 | 13.514 | 2 | 0.001 |
| **WK20*** | 187 | 85 | 32 | 15 | 0 | 0 | 134 | 84 | 25 | 16 | 0 | 0 | 9.494 | 2 | 0.009 |
| **WK21*** | 187 | 85 | 32 | 15 | 0 | 0 | 137 | 87 | 21 | 13 | 1 | 1 | 10.910 | 2 | 0.004 |
| **WK22** | 168 | 77 | 50 | 23 | 1 | 0 | 127 | 80 | 32 | 20 | 0 | 0 | 6.986 | 2 | 0.030 |
| **WK23** | 178 | 82 | 40 | 18 | 1 | 0 | 138 | 87 | 21 | 13 | 0 | 0 | 8.343 | 2 | 0.015 |
| **WK24*** | 177 | 81 | 42 | 19 | 0 | 0 | 141 | 89 | 18 | 11 | 0 | 0 | 13.638 | 2 | 0.001 |

## Table F-15
## WK for minority respondents

| Question | Web (N = 219) | | | | | | Paper (N = 159) | | | | | | Pearson's Chi-2 | df | sig |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | | | |
| | # | % | # | % | # | % | # | % | # | % | # | % | | | |
| **WK25*** | 126 | 58 | 93 | 42 | 0 | 0 | 102 | 65 | 56 | 35 | 1 | 1 | 12.658 | 2 | 0.002 |
| **WK26** | 145 | 67 | 72 | 33 | 2 | 1 | 101 | 64 | 57 | 36 | 1 | 1 | 6.032 | 2 | 0.049 |
| **WK27** | 193 | 89 | 25 | 11 | 1 | 0 | 141 | 89 | 17 | 11 | 1 | 1 | 7.918 | 2 | 0.019 |
| **WK28** | 175 | 81 | 41 | 19 | 3 | 1 | 139 | 87 | 20 | 13 | 0 | 0 | 5.770 | 2 | 0.056 |
| **WK29** | 126 | 58 | 91 | 42 | 2 | 1 | 89 | 56 | 70 | 44 | 0 | 0 | 4.677 | 2 | 0.096 |
| **WK30** | 132 | 61 | 84 | 39 | 3 | 1 | 101 | 64 | 58 | 36 | 0 | 0 | 3.251 | 2 | 0.197 |
| **WK31** | 134 | 63 | 80 | 37 | 5 | 2 | 98 | 62 | 60 | 38 | 1 | 1 | 1.875 | 2 | 0.392 |
| **WK32** | 99 | 46 | 114 | 54 | 6 | 3 | 86 | 54 | 72 | 46 | 1 | 1 | 3.452 | 2 | 0.178 |
| **WK33** | 45 | 21 | 167 | 79 | 7 | 3 | 35 | 22 | 124 | 78 | 0 | 0 | 0.314 | 2 | 0.855 |
| **WK34*** | 105 | 49 | 108 | 51 | 6 | 3 | 104 | 65 | 55 | 35 | 0 | 0 | 10.212 | 2 | 0.006 |
| **WK35** | 105 | 50 | 106 | 50 | 8 | 4 | 76 | 48 | 81 | 52 | 2 | 1 | 0.766 | 2 | 0.682 |

* Significant difference between paper and web ($p < .01$).

## Table F-16
## PC for all respondents

| Question | Web (N = 740) | | | | | | Paper (N = 647) | | | | | | Pearson's Chi-2 | df | sig |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | | | |
| | # | % | # | % | # | % | # | % | # | % | # | % | | | |
| **PC01*** | 664 | 90 | 74 | 10 | 2 | 0 | 616 | 95 | 31 | 5 | 0 | 0 | 21.731 | 2 | 0.000 |
| **PC02*** | 599 | 81 | 141 | 19 | 0 | 0 | 569 | 88 | 78 | 12 | 0 | 0 | 24.660 | 2 | 0.000 |
| **PC03** | 671 | 91 | 64 | 9 | 5 | 1 | 585 | 90 | 62 | 10 | 0 | 0 | 3.980 | 2 | 0.137 |
| **PC04*** | 591 | 80 | 147 | 20 | 2 | 0 | 575 | 89 | 71 | 11 | 1 | 0 | 27.184 | 2 | 0.000 |
| **PC05*** | 609 | 82 | 128 | 18 | 3 | 0 | 582 | 90 | 65 | 10 | 0 | 0 | 20.934 | 2 | 0.000 |
| **PC06*** | 633 | 86 | 105 | 14 | 2 | 0 | 580 | 90 | 66 | 10 | 1 | 0 | 12.692 | 2 | 0.002 |
| **PC07*** | 616 | 83 | 122 | 17 | 2 | 0 | 584 | 90 | 63 | 10 | 0 | 0 | 20.996 | 2 | 0.000 |
| **PC08*** | 619 | 84 | 118 | 16 | 3 | 0 | 583 | 90 | 64 | 10 | 0 | 0 | 17.193 | 2 | 0.000 |
| **PC09*** | 584 | 79 | 153 | 21 | 3 | 0 | 554 | 86 | 91 | 14 | 2 | 0 | 18.262 | 2 | 0.000 |
| **PC10*** | 673 | 91 | 62 | 9 | 5 | 1 | 611 | 94 | 34 | 6 | 2 | 0 | 12.423 | 2 | 0.002 |
| **PC11*** | 550 | 74 | 182 | 26 | 8 | 1 | 517 | 80 | 123 | 20 | 7 | 1 | 13.672 | 2 | 0.001 |
| **PC12*** | 429 | 58 | 299 | 42 | 12 | 1 | 416 | 64 | 222 | 36 | 9 | 1 | 10.720 | 2 | 0.005 |
| **PC13*** | 368 | 50 | 351 | 50 | 21 | 3 | 363 | 56 | 262 | 44 | 22 | 3 | 12.635 | 2 | 0.002 |
| **PC14** | 443 | 60 | 264 | 40 | 33 | 4 | 406 | 63 | 214 | 37 | 27 | 4 | 3.462 | 2 | 0.177 |
| **PC15*** | 340 | 46 | 351 | 54 | 49 | 6 | 388 | 60 | 235 | 40 | 24 | 4 | 22.707 | 2 | 0.000 |

* Significant difference between paper and web ($p < .01$).

## Table F-17
## PC for male respondents

| Question | Web (N = 551) | | | | | | Paper (N = 511) | | | | | | Pearson's Chi-2 | df | sig |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | | | |
| | # | % | # | % | # | % | # | % | # | % | # | % | | | |
| **PC01*** | 496 | 90 | 53 | 10 | 2 | 0 | 486 | 90 | 25 | 10 | 0 | 0 | 13.646 | 2 | 0.001 |
| **PC02*** | 448 | 81 | 103 | 19 | 0 | 0 | 449 | 81 | 62 | 19 | 0 | 0 | 17.161 | 2 | 0.000 |
| **PC03** | 498 | 91 | 50 | 9 | 3 | 1 | 467 | 91 | 44 | 9 | 0 | 0 | 4.136 | 2 | 0.126 |
| **PC04*** | 450 | 82 | 100 | 18 | 1 | 0 | 459 | 82 | 51 | 18 | 1 | 0 | 21.172 | 2 | 0.000 |
| **PC05*** | 457 | 83 | 92 | 17 | 2 | 0 | 460 | 83 | 51 | 17 | 0 | 0 | 15.383 | 2 | 0.000 |
| **PC06*** | 470 | 86 | 79 | 14 | 2 | 0 | 457 | 86 | 53 | 14 | 1 | 0 | 9.811 | 2 | 0.007 |
| **PC07*** | 467 | 85 | 82 | 15 | 2 | 0 | 462 | 85 | 49 | 15 | 0 | 0 | 12.791 | 2 | 0.002 |
| **PC08*** | 463 | 84 | 86 | 16 | 2 | 0 | 461 | 84 | 50 | 16 | 0 | 0 | 13.966 | 2 | 0.001 |
| **PC09** | 448 | 82 | 100 | 18 | 3 | 1 | 441 | 82 | 70 | 18 | 0 | 0 | 8.623 | 2 | 0.013 |
| **PC10** | 498 | 91 | 48 | 9 | 5 | 1 | 483 | 91 | 28 | 9 | 0 | 0 | 8.021 | 2 | 0.018 |
| **PC11*** | 400 | 74 | 143 | 26 | 8 | 1 | 413 | 74 | 94 | 26 | 4 | 1 | 12.670 | 2 | 0.002 |
| **PC12** | 312 | 58 | 228 | 42 | 11 | 2 | 323 | 58 | 183 | 42 | 5 | 1 | 6.025 | 2 | 0.049 |
| **PC13** | 279 | 52 | 255 | 48 | 17 | 3 | 290 | 52 | 205 | 48 | 16 | 3 | 7.976 | 2 | 0.019 |
| **PC14** | 338 | 64 | 188 | 36 | 25 | 5 | 321 | 64 | 169 | 36 | 21 | 4 | 2.102 | 2 | 0.350 |
| **PC15*** | 265 | 51 | 251 | 49 | 35 | 6 | 315 | 51 | 177 | 49 | 19 | 4 | 16.569 | 2 | 0.000 |

* Significant difference between paper and web ($p < .01$).

## Table F-18
## PC for female respondents

| Question | Web (N = 110) | | | | | | Paper (N = 88) | | | | | | Pearson's Chi-2 | df | sig |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | | | |
| | # | % | # | % | # | % | # | % | # | % | # | % | | | |
| **PC01*** | 95 | 86 | 15 | 14 | 0 | 0 | 87 | 99 | 1 | 1 | 0 | 0 | 12.637 | 2 | 0.002 |
| **PC02** | 89 | 81 | 21 | 19 | 0 | 0 | 79 | 90 | 9 | 10 | 0 | 0 | 5.381 | 2 | 0.068 |
| **PC03** | 103 | 95 | 5 | 5 | 2 | 2 | 80 | 91 | 8 | 9 | 0 | 0 | 1.607 | 2 | 0.448 |
| **PC04*** | 80 | 73 | 30 | 27 | 0 | 0 | 80 | 91 | 8 | 9 | 0 | 0 | 10.996 | 2 | 0.004 |
| **PC05** | 87 | 80 | 22 | 20 | 1 | 1 | 80 | 91 | 8 | 9 | 0 | 0 | 4.684 | 2 | 0.096 |
| **PC06** | 96 | 87 | 14 | 13 | 0 | 0 | 84 | 95 | 4 | 5 | 0 | 0 | 4.544 | 2 | 0.103 |
| **PC07*** | 89 | 81 | 21 | 19 | 0 | 0 | 85 | 97 | 3 | 3 | 0 | 0 | 11.861 | 2 | 0.003 |
| **PC08*** | 92 | 84 | 17 | 16 | 1 | 1 | 87 | 99 | 1 | 1 | 0 | 0 | 12.302 | 2 | 0.002 |
| **PC09*** | 81 | 74 | 29 | 26 | 0 | 0 | 80 | 91 | 8 | 9 | 0 | 0 | 10.176 | 2 | 0.006 |
| **PC10** | 102 | 93 | 8 | 7 | 0 | 0 | 83 | 94 | 5 | 6 | 0 | 0 | 0.792 | 2 | 0.673 |
| **PC11** | 88 | 80 | 22 | 20 | 0 | 0 | 72 | 82 | 16 | 18 | 0 | 0 | 0.694 | 2 | 0.707 |
| **PC12** | 66 | 60 | 44 | 40 | 0 | 0 | 66 | 76 | 21 | 24 | 1 | 1 | 7.021 | 2 | 0.030 |
| **PC13** | 53 | 48 | 57 | 52 | 0 | 0 | 52 | 60 | 35 | 40 | 1 | 1 | 4.121 | 2 | 0.127 |
| **PC14** | 66 | 61 | 42 | 39 | 2 | 2 | 59 | 68 | 28 | 32 | 1 | 1 | 1.009 | 2 | 0.604 |
| **PC15*** | 41 | 41 | 60 | 59 | 9 | 8 | 56 | 64 | 31 | 26 | 1 | 1 | 13.282 | 2 | 0.001 |

* Significant difference between paper and web ($p < .01$).

## Table F-19
## PC for majority respondents

| | Web (N = 352) | | | | | | Paper (N = 391) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | Pearson's | | |
| Question | # | % | # | % | # | % | # | % | # | % | # | % | Chi-2 | df | sig |
| **PC01** | 322 | 91 | 29 | 8 | 1 | 0 | 376 | 96 | 15 | 4 | 0 | 0 | 8.779 | 2 | 0.012 |
| **PC02** | 292 | 83 | 60 | 17 | 0 | 0 | 344 | 88 | 47 | 12 | 0 | 0 | 7.704 | 2 | 0.021 |
| **PC03** | 323 | 92 | 25 | 7 | 4 | 1 | 362 | 93 | 29 | 7 | 0 | 0 | 0.149 | 2 | 0.928 |
| **PC04*** | 293 | 83 | 58 | 16 | 1 | 0 | 359 | 92 | 32 | 8 | 0 | 0 | 13.564 | 2 | 0.001 |
| **PC05** | 292 | 83 | 58 | 16 | 2 | 1 | 352 | 90 | 39 | 10 | 0 | 0 | 8.308 | 2 | 0.016 |
| **PC06** | 305 | 87 | 47 | 13 | 0 | 0 | 356 | 91 | 35 | 9 | 0 | 0 | 7.555 | 2 | 0.023 |
| **PC07** | 300 | 85 | 51 | 14 | 1 | 0 | 357 | 91 | 34 | 9 | 0 | 0 | 9.166 | 2 | 0.010 |
| **PC08** | 304 | 86 | 46 | 13 | 2 | 1 | 357 | 91 | 34 | 9 | 0 | 0 | 5.529 | 2 | 0.063 |
| **PC09** | 294 | 84 | 56 | 16 | 2 | 1 | 343 | 88 | 48 | 12 | 0 | 0 | 3.858 | 2 | 0.145 |
| **PC10** | 319 | 91 | 30 | 9 | 3 | 1 | 373 | 95 | 18 | 5 | 0 | 0 | 5.755 | 2 | 0.056 |
| **PC11** | 267 | 76 | 81 | 23 | 4 | 1 | 321 | 82 | 68 | 17 | 2 | 1 | 4.965 | 2 | 0.084 |
| **PC12** | 216 | 61 | 130 | 37 | 6 | 2 | 259 | 66 | 128 | 33 | 4 | 1 | 2.419 | 2 | 0.298 |
| **PC13** | 188 | 53 | 156 | 44 | 8 | 2 | 241 | 62 | 141 | 36 | 9 | 2 | 6.979 | 2 | 0.031 |
| **PC14** | 225 | 64 | 117 | 33 | 10 | 3 | 257 | 66 | 122 | 31 | 12 | 3 | 2.036 | 2 | 0.361 |
| **PC15*** | 171 | 49 | 163 | 46 | 18 | 5 | 256 | 65 | 124 | 32 | 11 | 3 | 19.479 | 2 | 0.000 |

* Significant difference between paper and web ($p < .01$).

## Table F-20
## PC for minority respondents

| Question | Web (N=218) | | | | | | Paper (N=158) | | | | | | Pearson's Chi-2 | df | sig |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | | | |
| | # | % | # | % | # | % | # | % | # | % | # | % | | | |
| **PC01*** | 182 | 84 | 35 | 16 | 1 | 0 | 149 | 94 | 9 | 6 | 0 | 0 | 17.322 | 2 | 0.000 |
| **PC02*** | 173 | 79 | 45 | 21 | 0 | 0 | 139 | 88 | 19 | 12 | 0 | 0 | 15.473 | 2 | 0.000 |
| **PC03** | 189 | 87 | 28 | 13 | 1 | 0 | 143 | 91 | 15 | 9 | 0 | 0 | 6.735 | 2 | 0.034 |
| **PC04*** | 158 | 72 | 60 | 28 | 0 | 0 | 136 | 87 | 21 | 13 | 1 | 1 | 19.905 | 2 | 0.000 |
| **PC05*** | 173 | 80 | 44 | 20 | 1 | 0 | 142 | 90 | 16 | 10 | 0 | 0 | 12.661 | 2 | 0.002 |
| **PC06** | 182 | 84 | 34 | 16 | 2 | 1 | 142 | 90 | 15 | 10 | 1 | 1 | 8.164 | 2 | 0.017 |
| **PC07** | 179 | 82 | 38 | 18 | 1 | 0 | 140 | 89 | 18 | 11 | 0 | 0 | 8.373 | 2 | 0.015 |
| **PC08*** | 174 | 80 | 43 | 20 | 1 | 0 | 144 | 91 | 14 | 9 | 0 | 0 | 14.157 | 2 | 0.001 |
| **PC09*** | 165 | 76 | 52 | 24 | 1 | 0 | 134 | 85 | 24 | 15 | 0 | 0 | 10.024 | 2 | 0.007 |
| **PC10** | 199 | 92 | 18 | 8 | 1 | 0 | 144 | 91 | 14 | 9 | 0 | 0 | 5.732 | 2 | 0.057 |
| **PC11** | 153 | 71 | 62 | 29 | 3 | 1 | 125 | 80 | 32 | 20 | 1 | 1 | 7.157 | 2 | 0.028 |
| **PC12** | 104 | 49 | 110 | 51 | 4 | 2 | 99 | 63 | 59 | 37 | 0 | 0 | 9.082 | 2 | 0.011 |
| **PC13** | 90 | 42 | 122 | 58 | 6 | 3 | 79 | 52 | 74 | 48 | 5 | 3 | 7.110 | 2 | 0.029 |
| **PC14** | 121 | 59 | 84 | 41 | 13 | 6 | 94 | 62 | 57 | 38 | 7 | 4 | 1.324 | 2 | 0.516 |
| **PC15** | 88 | 44 | 110 | 56 | 20 | 9 | 92 | 61 | 60 | 39 | 6 | 4 | 9.071 | 2 | 0.011 |

* Significant difference between paper and web ($p < .01$).

## Table F-21
## MK for all respondents

| Question | Web (N = 739) | | | | | | Paper (N = 648) | | | | | | Pearson's Chi-2 | df | sig |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | | | |
| | # | % | # | % | # | % | # | % | # | % | # | % | | | |
| **MK01*** | 709 | 96 | 29 | 4 | 1 | 0 | 604 | 93 | 44 | 7 | 0 | 0 | 16.202 | 2 | 0.000 |
| **MK02*** | 715 | 97 | 24 | 3 | 0 | 0 | 624 | 96 | 24 | 4 | 0 | 0 | 13.245 | 2 | 0.001 |
| **MK03*** | 704 | 95 | 34 | 5 | 1 | 0 | 624 | 96 | 23 | 4 | 1 | 0 | 12.340 | 2 | 0.002 |
| **MK04** | 515 | 70 | 218 | 30 | 6 | 0 | 463 | 71 | 179 | 29 | 6 | 0 | 7.666 | 2 | 0.022 |
| **MK05** | 637 | 86 | 99 | 14 | 3 | 0 | 573 | 88 | 73 | 12 | 2 | 0 | 8.683 | 2 | 0.013 |
| **MK06*** | 695 | 94 | 43 | 6 | 1 | 0 | 587 | 91 | 60 | 9 | 1 | 0 | 16.712 | 2 | 0.000 |
| **MK07** | 612 | 83 | 117 | 17 | 10 | 1 | 553 | 85 | 94 | 15 | 1 | 0 | 1.611 | 2 | 0.447 |
| **MK08*** | 587 | 79 | 147 | 21 | 5 | 0 | 525 | 81 | 113 | 19 | 10 | 1 | 12.883 | 2 | 0.002 |
| **MK09*** | 539 | 73 | 198 | 27 | 2 | 0 | 461 | 71 | 186 | 29 | 1 | 0 | 10.410 | 2 | 0.005 |
| **MK10** | 537 | 73 | 193 | 27 | 9 | 1 | 512 | 79 | 134 | 21 | 2 | 0 | 7.919 | 2 | 0.019 |
| **MK11** | 565 | 76 | 167 | 24 | 7 | 0 | 509 | 79 | 136 | 21 | 3 | 0 | 4.487 | 2 | 0.106 |
| **MK12** | 500 | 68 | 238 | 32 | 1 | 0 | 439 | 68 | 209 | 32 | 0 | 0 | 8.726 | 2 | 0.013 |
| **MK13** | 499 | 68 | 235 | 32 | 5 | 0 | 450 | 69 | 192 | 31 | 6 | 0 | 9.101 | 2 | 0.011 |
| **MK14** | 532 | 72 | 204 | 28 | 3 | 0 | 470 | 73 | 175 | 27 | 3 | 0 | 8.456 | 2 | 0.015 |
| **MK15*** | 552 | 75 | 186 | 25 | 1 | 0 | 490 | 76 | 157 | 24 | 1 | 0 | 9.800 | 2 | 0.007 |
| **MK16** | 283 | 38 | 449 | 62 | 7 | 0 | 242 | 37 | 401 | 63 | 5 | 0 | 5.549 | 2 | 0.062 |
| **MK17*** | 500 | 68 | 234 | 32 | 5 | 0 | 459 | 71 | 183 | 29 | 6 | 0 | 9.966 | 2 | 0.007 |
| **MK18** | 468 | 63 | 266 | 37 | 5 | 0 | 439 | 68 | 208 | 32 | 1 | 0 | 6.837 | 2 | 0.033 |
| **MK19** | 430 | 58 | 306 | 42 | 3 | 0 | 382 | 59 | 265 | 41 | 1 | 0 | 8.110 | 2 | 0.017 |
| **MK20** | 367 | 50 | 366 | 50 | 6 | 0 | 339 | 52 | 306 | 48 | 3 | 0 | 7.889 | 2 | 0.019 |
| **MK21** | 432 | 58 | 297 | 42 | 10 | 1 | 375 | 58 | 265 | 42 | 8 | 1 | 5.673 | 2 | 0.059 |

## Table F-21
## MK for all respondents

| Question | Web (N = 739) | | | | | | Paper (N = 648) | | | | | | Pearson's Chi-2 | df | sig |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | | | |
| | # | % | # | % | # | % | # | % | # | % | # | % | | | |
| **MK22** | 321 | 43 | 403 | 57 | 15 | 2 | 319 | 49 | 324 | 51 | 5 | 0 | 4.609 | 2 | 0.100 |
| **MK23** | 264 | 36 | 465 | 64 | 10 | 1 | 235 | 36 | 404 | 64 | 9 | 1 | 5.419 | 2 | 0.067 |
| **MK24** | 395 | 53 | 333 | 47 | 11 | 1 | 383 | 59 | 258 | 41 | 7 | 1 | 7.666 | 2 | 0.022 |
| **MK25** | 371 | 50 | 351 | 50 | 17 | 2 | 331 | 51 | 313 | 49 | 4 | 0 | 0.260 | 2 | 0.878 |

* Significant difference between paper and web ($p < .01$).

## Table F-22
## MK for male respondents

| Question | Web (N = 549) | | | | | | Paper (N = 512) | | | | | | Pearson's Chi-2 | df | sig |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | | | |
| | # | % | # | % | # | % | # | % | # | % | # | % | | | |
| **MK01*** | 528 | 96 | 20 | 4 | 1 | 0 | 475 | 93 | 37 | 7 | 0 | 0 | 13.556 | 2 | 0.001 |
| **MK02*** | 535 | 97 | 14 | 3 | 0 | 0 | 494 | 96 | 18 | 4 | 0 | 0 | 9.996 | 2 | 0.007 |
| **MK03** | 523 | 95 | 25 | 5 | 1 | 0 | 495 | 97 | 16 | 3 | 1 | 0 | 8.929 | 2 | 0.012 |
| **MK04** | 395 | 72 | 151 | 28 | 3 | 1 | 367 | 72 | 140 | 28 | 5 | 1 | 6.772 | 2 | 0.034 |
| **MK05** | 472 | 86 | 75 | 14 | 2 | 0 | 453 | 89 | 57 | 11 | 2 | 0 | 6.966 | 2 | 0.031 |
| **MK06*** | 521 | 95 | 27 | 5 | 1 | 0 | 464 | 91 | 47 | 9 | 1 | 0 | 14.341 | 2 | 0.001 |
| **MK07** | 456 | 84 | 84 | 16 | 9 | 2 | 431 | 84 | 80 | 16 | 1 | 0 | 0.279 | 2 | 0.870 |
| **MK08** | 445 | 82 | 99 | 18 | 5 | 1 | 412 | 82 | 92 | 18 | 8 | 2 | 6.692 | 2 | 0.035 |
| **MK09** | 408 | 75 | 139 | 25 | 2 | 0 | 375 | 73 | 136 | 27 | 1 | 0 | 6.458 | 2 | 0.040 |
| **MK10** | 400 | 74 | 143 | 26 | 6 | 1 | 407 | 80 | 104 | 20 | 1 | 0 | 6.329 | 2 | 0.042 |
| **MK11** | 436 | 80 | 107 | 20 | 6 | 1 | 416 | 82 | 94 | 18 | 2 | 0 | 2.135 | 2 | 0.344 |
| **MK12** | 390 | 71 | 158 | 29 | 1 | 0 | 358 | 70 | 154 | 30 | 0 | 0 | 5.512 | 2 | 0.064 |
| **MK13** | 379 | 70 | 166 | 30 | 4 | 1 | 362 | 71 | 146 | 29 | 4 | 1 | 5.165 | 2 | 0.076 |
| **MK14** | 403 | 74 | 145 | 26 | 1 | 0 | 383 | 75 | 126 | 25 | 3 | 1 | 8.289 | 2 | 0.016 |
| **MK15** | 428 | 78 | 120 | 22 | 1 | 0 | 399 | 78 | 112 | 22 | 1 | 0 | 6.182 | 2 | 0.045 |
| **MK16** | 211 | 39 | 331 | 61 | 7 | 1 | 193 | 38 | 315 | 62 | 4 | 1 | 2.380 | 2 | 0.304 |
| **MK17** | 381 | 70 | 164 | 30 | 4 | 1 | 365 | 72 | 142 | 28 | 5 | 1 | 6.000 | 2 | 0.050 |
| **MK18** | 347 | 64 | 198 | 26 | 4 | 1 | 351 | 69 | 161 | 31 | 0 | 0 | 4.963 | 2 | 0.084 |
| **MK19** | 319 | 58 | 227 | 36 | 3 | 1 | 309 | 60 | 203 | 40 | 0 | 0 | 4.413 | 2 | 0.110 |
| **MK20** | 281 | 52 | 263 | 48 | 5 | 1 | 266 | 52 | 244 | 48 | 2 | 0 | 3.414 | 2 | 0.181 |
| **MK21** | 323 | 60 | 119 | 40 | 7 | 1 | 305 | 60 | 201 | 40 | 6 | 1 | 4.243 | 2 | 0.120 |

## Table F-22
## MK for male respondents

| Question | Web (N = 549) | | | | | | Paper (N = 512) | | | | | | Pearson's Chi-2 | df | sig |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | | | |
| | # | % | # | % | # | % | # | % | # | % | # | % | | | |
| **MK22** | 254 | 47 | 282 | 53 | 13 | 2 | 262 | 52 | 246 | 48 | 4 | 1 | 1.999 | 2 | 0.368 |
| **MK23** | 198 | 37 | 343 | 63 | 8 | 1 | 189 | 37 | 117 | 63 | 6 | 1 | 2.692 | 2 | 0.260 |
| **MK24** | 293 | 54 | 248 | 46 | 8 | 1 | 306 | 60 | 200 | 40 | 6 | 1 | 6.886 | 2 | 0.032 |
| **MK25** | 281 | 52 | 257 | 48 | 11 | 2 | 274 | 54 | 235 | 46 | 3 | 1 | 0.529 | 2 | 0.768 |

* Significant difference between paper and web ($p < .01$).

## Table F-23
## MK for female respondents

| Question | Web (N = 111) | | | | | | Paper (N = 88) | | | | | | Pearson's Chi-2 | df | sig |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | | | |
| | # | % | # | % | # | % | # | % | # | % | # | % | | | |
| **MK01** | 105 | 95 | 6 | 5 | 0 | 0 | 84 | 95 | 4 | 5 | 0 | 0 | 2.567 | 2 | 0.277 |
| **MK02** | 104 | 94 | 7 | 6 | 0 | 0 | 83 | 94 | 5 | 6 | 0 | 0 | 2.525 | 2 | 0.283 |
| **MK03** | 106 | 95 | 5 | 5 | 0 | 0 | 84 | 95 | 4 | 5 | 0 | 0 | 2.492 | 2 | 0.288 |
| **MK04** | 72 | 66 | 37 | 34 | 2 | 2 | 66 | 75 | 22 | 25 | 0 | 0 | 1.901 | 2 | 0.387 |
| **MK05** | 95 | 86 | 15 | 24 | 1 | 1 | 81 | 92 | 7 | 8 | 0 | 0 | 2.186 | 2 | 0.335 |
| **MK06** | 103 | 93 | 8 | 7 | 0 | 0 | 82 | 93 | 6 | 7 | 0 | 0 | 2.503 | 2 | 0.286 |
| **MK07*** | 89 | 80 | 22 | 20 | 0 | 0 | 84 | 95 | 4 | 5 | 0 | 0 | 12.549 | 2 | 0.002 |
| **MK08** | 89 | 80 | 22 | 20 | 0 | 0 | 76 | 87 | 11 | 13 | 1 | 1 | 5.558 | 2 | 0.062 |
| **MK09** | 75 | 68 | 36 | 32 | 0 | 0 | 59 | 67 | 29 | 33 | 0 | 0 | 2.498 | 2 | 0.287 |
| **MK10** | 84 | 78 | 24 | 22 | 3 | 3 | 74 | 84 | 14 | 26 | 0 | 0 | 1.284 | 2 | 0.526 |
| **MK11** | 78 | 71 | 32 | 29 | 1 | 1 | 61 | 69 | 27 | 31 | 0 | 0 | 0.649 | 2 | 0.723 |
| **MK12** | 62 | 56 | 49 | 44 | 0 | 0 | 54 | 61 | 34 | 39 | 0 | 0 | 3.102 | 2 | 0.212 |
| **MK13** | 70 | 63 | 41 | 37 | 0 | 0 | 62 | 71 | 25 | 29 | 1 | 1 | 5.227 | 2 | 0.073 |
| **MK14** | 68 | 62 | 41 | 38 | 2 | 2 | 59 | 67 | 29 | 33 | 0 | 0 | 0.506 | 2 | 0.776 |
| **MK15** | 69 | 62 | 42 | 38 | 0 | 0 | 60 | 68 | 28 | 32 | 0 | 0 | 3.270 | 2 | 0.195 |
| **MK16** | 45 | 41 | 66 | 59 | 0 | 0 | 39 | 45 | 48 | 55 | 1 | 1 | 4.122 | 2 | 0.127 |
| **MK17** | 68 | 62 | 42 | 38 | 1 | 1 | 65 | 75 | 22 | 25 | 1 | 1 | 5.180 | 2 | 0.075 |
| **MK18** | 71 | 65 | 39 | 35 | 1 | 1 | 57 | 65 | 31 | 35 | 0 | 0 | 0.591 | 2 | 0.744 |
| **MK19** | 70 | 63 | 41 | 37 | 0 | 0 | 53 | 60 | 35 | 40 | 0 | 0 | 2.658 | 2 | 0.265 |
| **MK20** | 49 | 44 | 62 | 54 | 0 | 0 | 47 | 53 | 41 | 47 | 0 | 0 | 4.175 | 2 | 0.124 |
| **MK21** | 65 | 60 | 44 | 40 | 2 | 2 | 52 | 60 | 35 | 40 | 1 | 1 | 0.481 | 2 | 0.786 |

## Table F-23
## MK for female respondents

| Question | Web (N = 111) | | | | | | Paper (N = 88) | | | | | | Pearson's Chi-2 | df | sig |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | | | |
| | # | % | # | % | # | % | # | % | # | % | # | % | | | |
| **MK22** | 38 | 35 | 72 | 65 | 1 | 1 | 41 | 47 | 47 | 53 | 0 | 0 | 3.544 | 2 | 0.170 |
| **MK23** | 42 | 38 | 68 | 62 | 1 | 1 | 33 | 38 | 53 | 62 | 2 | 2 | 2.574 | 2 | 0.276 |
| **MK24** | 60 | 55 | 50 | 45 | 1 | 1 | 56 | 64 | 32 | 36 | 0 | 0 | 2.253 | 2 | 0.324 |
| **MK25** | 51 | 47 | 57 | 53 | 3 | 3 | 38 | 43 | 50 | 57 | 0 | 0 | 0.367 | 2 | 0.832 |

* Significant difference between paper and web ($p < .01$).

## Table F-24
## MK for majority respondents

| | Web (N = 350) | | | | | | Paper (N =3 92) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | Pearson's | | |
| Question | # | % | # | % | # | % | # | % | # | % | # | % | Chi-2 | df | sig |
| **MK01** | 333 | 95 | 16 | 5 | 1 | 0 | 367 | 94 | 25 | 6 | 0 | 0 | 3.411 | 2 | 0.182 |
| **MK02** | 340 | 97 | 10 | 3 | 0 | 0 | 380 | 97 | 12 | 3 | 0 | 0 | 3.883 | 2 | 0.144 |
| **MK03** | 330 | 94 | 19 | 5 | 1 | 0 | 379 | 97 | 12 | 3 | 1 | 0 | 5.494 | 2 | 0.064 |
| **MK04** | 252 | 72 | 96 | 27 | 2 | 1 | 285 | 73 | 105 | 27 | 2 | 1 | 1.421 | 2 | 0.491 |
| **MK05** | 305 | 87 | 45 | 13 | 0 | 0 | 344 | 88 | 46 | 12 | 2 | 1 | 3.888 | 2 | 0.143 |
| **MK06** | 335 | 96 | 15 | 4 | 0 | 0 | 356 | 91 | 36 | 9 | 0 | 0 | 9.224 | 2 | 0.010 |
| **MK07** | 295 | 84 | 47 | 13 | 8 | 2 | 338 | 86 | 53 | 14 | 1 | 0 | 0.553 | 2 | 0.759 |
| **MK08** | 285 | 81 | 63 | 18 | 2 | 1 | 323 | 82 | 65 | 17 | 4 | 1 | 2.742 | 2 | 0.254 |
| **MK09** | 269 | 77 | 79 | 23 | 2 | 1 | 290 | 74 | 102 | 26 | 0 | 0 | 2.361 | 2 | 0.307 |
| **MK10** | 255 | 73 | 90 | 26 | 5 | 1 | 321 | 82 | 70 | 18 | 1 | 0 | 7.102 | 2 | 0.029 |
| **MK11** | 290 | 83 | 57 | 16 | 3 | 1 | 334 | 85 | 57 | 15 | 1 | 0 | 0.840 | 2 | 0.657 |
| **MK12** | 247 | 71 | 102 | 29 | 1 | 1 | 274 | 70 | 118 | 30 | 0 | 0 | 1.249 | 2 | 0.535 |
| **MK13** | 252 | 72 | 96 | 27 | 2 | 1 | 283 | 72 | 107 | 27 | 2 | 1 | 1.390 | 2 | 0.499 |
| **MK14** | 255 | 73 | 93 | 27 | 2 | 1 | 310 | 79 | 80 | 20 | 2 | 1 | 5.258 | 2 | 0.072 |
| **MK15** | 271 | 77 | 78 | 22 | 1 | 1 | 313 | 80 | 79 | 20 | 0 | 0 | 1.672 | 2 | 0.433 |
| **MK16** | 142 | 41 | 205 | 59 | 3 | 1 | 152 | 39 | 236 | 60 | 4 | 1 | 1.897 | 2 | 0.387 |
| **MK17** | 240 | 69 | 109 | 31 | 1 | 1 | 288 | 73 | 100 | 26 | 4 | 1 | 6.345 | 2 | 0.042 |
| **MK18** | 227 | 65 | 121 | 35 | 2 | 1 | 277 | 71 | 115 | 29 | 0 | 0 | 3.183 | 2 | 0.204 |
| **MK19** | 216 | 62 | 132 | 38 | 2 | 1 | 242 | 62 | 150 | 38 | 0 | 0 | 0.517 | 2 | 0.772 |
| **MK20** | 177 | 51 | 171 | 49 | 2 | 1 | 207 | 53 | 183 | 47 | 2 | 0 | 1.707 | 2 | 0.426 |
| **MK21** | 208 | 59 | 139 | 40 | 3 | 1 | 247 | 63 | 142 | 36 | 3 | 1 | 2.059 | 2 | 0.357 |

## Table F-24
## MK for majority respondents

| Question | Web (N = 350) | | | | | | Paper (N =3 92) | | | | | | Pearson's Chi-2 | df | sig |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | | | |
| | # | % | # | % | # | % | # | % | # | % | # | % | | | |
| **MK22** | 172 | 49 | 173 | 49 | 5 | 1 | 223 | 57 | 167 | 43 | 2 | 0 | 3.870 | 2 | 0.144 |
| **MK23** | 129 | 37 | 117 | 33 | 4 | 1 | 147 | 38 | 239 | 61 | 6 | 2 | 1.226 | 2 | 0.542 |
| **MK24** | 196 | 56 | 152 | 43 | 2 | 1 | 237 | 60 | 150 | 38 | 5 | 1 | 3.979 | 2 | 0.137 |
| **MK25** | 183 | 52 | 162 | 46 | 5 | 1 | 212 | 54 | 177 | 45 | 3 | 1 | 0.202 | 2 | 0.904 |

## Table F-25
## MK for minority respondents

| Question | Web (N=219) | | | | | | Paper (N=158) | | | | | | Pearson's Chi-2 | df | sig |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | | | |
| | # | % | # | % | # | % | # | % | # | % | # | % | | | |
| **MK01*** | 213 | 97 | 6 | 3 | 0 | 0 | 146 | 92 | 12 | 8 | 0 | 0 | 15.502 | 2 | 0.000 |
| **MK02*** | 210 | 96 | 9 | 4 | 0 | 0 | 149 | 94 | 9 | 6 | 0 | 0 | 11.283 | 2 | 0.004 |
| **MK03*** | 214 | 98 | 5 | 2 | 0 | 0 | 151 | 96 | 7 | 4 | 0 | 0 | 12.141 | 2 | 0.002 |
| **MK04** | 146 | 68 | 70 | 32 | 3 | 1 | 112 | 72 | 44 | 18 | 2 | 1 | 7.017 | 2 | 0.030 |
| **MK05*** | 180 | 83 | 38 | 17 | 1 | 0 | 146 | 92 | 12 | 8 | 0 | 0 | 15.508 | 2 | 0.000 |
| **MK06** | 201 | 92 | 17 | 8 | 1 | 0 | 144 | 91 | 14 | 9 | 0 | 0 | 8.008 | 2 | 0.018 |
| **MK07*** | 179 | 82 | 40 | 18 | 0 | 0 | 135 | 85 | 23 | 15 | 0 | 0 | 11.678 | 2 | 0.003 |
| **MK08*** | 177 | 81 | 41 | 19 | 1 | 0 | 128 | 83 | 26 | 17 | 4 | 3 | 13.498 | 2 | 0.001 |
| **MK09*** | 150 | 68 | 69 | 32 | 0 | 0 | 106 | 68 | 51 | 32 | 1 | 1 | 12.198 | 2 | 0.002 |
| **MK10** | 162 | 75 | 54 | 25 | 3 | 1 | 116 | 73 | 42 | 27 | 0 | 0 | 4.167 | 2 | 0.124 |
| **MK11** | 146 | 67 | 71 | 33 | 2 | 1 | 102 | 65 | 56 | 35 | 0 | 0 | 5.996 | 2 | 0.050 |
| **MK12*** | 136 | 62 | 83 | 38 | 0 | 0 | 106 | 67 | 52 | 33 | 0 | 0 | 11.764 | 2 | 0.003 |
| **MK13*** | 132 | 61 | 86 | 39 | 1 | 0 | 108 | 69 | 48 | 31 | 2 | 1 | 13.499 | 2 | 0.001 |
| **MK14** | 143 | 66 | 75 | 34 | 1 | 0 | 95 | 60 | 63 | 40 | 0 | 0 | 9.044 | 2 | 0.011 |
| **MK15*** | 154 | 70 | 65 | 30 | 0 | 0 | 106 | 68 | 51 | 32 | 1 | 1 | 12.492 | 2 | 0.002 |
| **MK16** | 77 | 35 | 141 | 65 | 1 | 0 | 60 | 38 | 98 | 62 | 0 | 0 | 8.149 | 2 | 0.017 |
| **MK17** | 144 | 67 | 72 | 33 | 3 | 1 | 103 | 66 | 54 | 34 | 1 | 1 | 5.179 | 2 | 0.075 |
| **MK18** | 129 | 59 | 89 | 41 | 1 | 0 | 97 | 61 | 61 | 49 | 0 | 0 | 8.059 | 2 | 0.018 |
| **MK19*** | 118 | 54 | 101 | 46 | 0 | 0 | 84 | 53 | 74 | 47 | 0 | 0 | 10.797 | 2 | 0.005 |
| **MK20** | 104 | 48 | 114 | 52 | 1 | 0 | 82 | 52 | 76 | 48 | 0 | 0 | 8.512 | 2 | 0.014 |
| **MK21** | 125 | 57 | 93 | 43 | 1 | 0 | 83 | 53 | 75 | 47 | 0 | 0 | 8.723 | 2 | 0.013 |

## Table F-25
## MK for minority respondents

| Question | Web (N=219) | | | | | | Paper (N=158) | | | | | | Pearson's Chi-2 | df | sig |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | | | |
| | # | % | # | % | # | % | # | % | # | % | # | % | | | |
| **MK22** | 75 | 35 | 142 | 65 | 2 | 1 | 60 | 38 | 97 | 62 | 1 | 1 | 7.439 | 2 | 0.024 |
| **MK23** | 76 | 35 | 141 | 65 | 2 | 1 | 56 | 35 | 102 | 65 | 0 | 0 | 5.702 | 2 | 0.058 |
| **MK24*** | 107 | 50 | 109 | 50 | 3 | 1 | 98 | 62 | 60 | 38 | 0 | 0 | 9.764 | 2 | 0.008 |
| **MK25** | 105 | 49 | 108 | 51 | 6 | 3 | 76 | 48 | 82 | 52 | 0 | 0 | 1.217 | 2 | 0.544 |

* Significant difference between paper and web ($p < .01$).

## Table F-26
## EI for all respondents

| Question | Web (N = 735) | | | | | | Paper (N = 647) | | | | | | Pearson's Chi-2 | df | sig |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | | | |
| | # | % | # | % | # | % | # | % | # | % | # | % | | | |
| **EI01** | 637 | 87 | 98 | 13 | 0 | 0 | 566 | 87 | 80 | 13 | 1 | 0 | 6.463 | 2 | 0.040 |
| **EI02** | 667 | 91 | 67 | 9 | 1 | 0 | 595 | 92 | 52 | 8 | 0 | 0 | 4.923 | 2 | 0.085 |
| **EI03** | 488 | 66 | 245 | 34 | 2 | 0 | 422 | 65 | 225 | 35 | 0 | 0 | 3.752 | 2 | 0.153 |
| **EI04** | 495 | 67 | 240 | 33 | 0 | 0 | 468 | 72 | 179 | 28 | 0 | 0 | 9.135 | 2 | 0.010 |
| **EI05** | 629 | 86 | 104 | 14 | 2 | 0 | 551 | 85 | 96 | 15 | 0 | 0 | 3.719 | 2 | 0.156 |
| **EI06** | 560 | 76 | 173 | 24 | 2 | 0 | 506 | 78 | 138 | 22 | 3 | 0 | 6.668 | 2 | 0.036 |
| **EI07** | 539 | 73 | 195 | 27 | 1 | 0 | 493 | 76 | 153 | 24 | 1 | 0 | 6.408 | 2 | 0.041 |
| **EI08** | 677 | 92 | 57 | 8 | 1 | 0 | 597 | 92 | 50 | 8 | 0 | 0 | 4.394 | 2 | 0.111 |
| **EI09** | 612 | 83 | 119 | 17 | 4 | 0 | 529 | 82 | 117 | 18 | 1 | 0 | 3.522 | 2 | 0.172 |
| **EI10** | 524 | 71 | 208 | 29 | 3 | 0 | 484 | 75 | 163 | 25 | 0 | 0 | 3.675 | 2 | 0.159 |
| **EI11** | 590 | 80 | 143 | 20 | 2 | 0 | 531 | 82 | 115 | 18 | 1 | 0 | 3.823 | 2 | 0.148 |
| **EI12** | 418 | 57 | 315 | 43 | 2 | 0 | 387 | 60 | 253 | 40 | 7 | 1 | 9.255 | 2 | 0.010 |
| **EI13** | 255 | 35 | 478 | 65 | 2 | 0 | 245 | 38 | 400 | 62 | 2 | 0 | 5.383 | 2 | 0.068 |
| **EI14** | 442 | 60 | 289 | 40 | 4 | 0 | 394 | 61 | 251 | 39 | 2 | 0 | 2.554 | 2 | 0.279 |
| **EI15** | 426 | 58 | 304 | 42 | 5 | 0 | 411 | 64 | 234 | 36 | 2 | 0 | 6.024 | 2 | 0.049 |
| **EI16** | 458 | 62 | 274 | 38 | 3 | 0 | 438 | 68 | 207 | 32 | 2 | 0 | 7.414 | 2 | 0.025 |
| **EI17** | 255 | 35 | 474 | 65 | 6 | 0 | 217 | 34 | 424 | 66 | 6 | 0 | 4.261 | 2 | 0.119 |
| **EI18** | 360 | 49 | 369 | 51 | 6 | 0 | 341 | 53 | 300 | 47 | 6 | 0 | 6.156 | 2 | 0.046 |
| **EI19** | 330 | 45 | 396 | 55 | 9 | 1 | 298 | 46 | 340 | 54 | 9 | 0 | 3.967 | 2 | 0.138 |
| **EI20*** | 300 | 41 | 430 | 59 | 5 | 0 | 296 | 46 | 341 | 54 | 10 | 1 | 11.668 | 2 | 0.003 |

* Significant difference between paper and web ($p < .01$).

## Table F-27
## EI for male respondents

| Question | Web (N = 545) | | | | | | Paper (N = 511) | | | | | | Pearson's Chi-2 | df | sig |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered Incorrectly | | Missing | | | | |
| | # | % | # | % | # | % | # | % | # | % | # | % | | | |
| **EI01** | 470 | 86 | 75 | 14 | 0 | 0 | 455 | 89 | 55 | 11 | 1 | 0 | 5.310 | 2 | 0.070 |
| **EI02** | 506 | 93 | 38 | 7 | 1 | 0 | 476 | 93 | 35 | 7 | 0 | 0 | 2.034 | 2 | 0.362 |
| **EI03** | 379 | 70 | 165 | 30 | 1 | 0 | 339 | 66 | 172 | 34 | 0 | 0 | 3.189 | 2 | 0.203 |
| **EI04** | 390 | 72 | 155 | 28 | 0 | 0 | 389 | 76 | 122 | 24 | 0 | 0 | 5.375 | 2 | 0.068 |
| **EI05** | 481 | 88 | 63 | 12 | 1 | 0 | 437 | 86 | 74 | 14 | 0 | 0 | 4.224 | 2 | 0.121 |
| **EI06** | 433 | 80 | 110 | 20 | 2 | 0 | 405 | 80 | 104 | 20 | 2 | 0 | 2.383 | 2 | 0.304 |
| **EI07** | 426 | 78 | 118 | 22 | 1 | 0 | 397 | 78 | 113 | 22 | 1 | 0 | 2.617 | 2 | 0.270 |
| **EI08** | 510 | 94 | 34 | 6 | 1 | 0 | 471 | 92 | 40 | 8 | 0 | 0 | 2.768 | 2 | 0.251 |
| **EI09** | 476 | 88 | 67 | 12 | 2 | 0 | 427 | 84 | 83 | 16 | 1 | 0 | 5.192 | 2 | 0.075 |
| **EI10** | 418 | 77 | 124 | 23 | 3 | 1 | 412 | 81 | 99 | 19 | 0 | 0 | 2.323 | 2 | 0.313 |
| **EI11** | 452 | 83 | 91 | 17 | 2 | 0 | 427 | 84 | 84 | 16 | 0 | 0 | 0.908 | 2 | 0.635 |
| **EI12** | 327 | 60 | 216 | 40 | 2 | 0 | 322 | 64 | 185 | 36 | 4 | 1 | 3.900 | 2 | 0.142 |
| **EI13** | 201 | 37 | 343 | 63 | 1 | 0 | 206 | 40 | 304 | 60 | 1 | 0 | 3.122 | 2 | 0.210 |
| **EI14** | 357 | 66 | 186 | 34 | 2 | 0 | 331 | 65 | 179 | 35 | 1 | 0 | 1.405 | 2 | 0.495 |
| **EI15** | 342 | 63 | 199 | 37 | 4 | 1 | 349 | 68 | 161 | 32 | 1 | 0 | 3.543 | 2 | 0.170 |
| **EI16** | 369 | 68 | 174 | 32 | 2 | 0 | 360 | 70 | 151 | 30 | 0 | 0 | 1.706 | 2 | 0.426 |
| **EI17** | 200 | 37 | 340 | 63 | 5 | 1 | 170 | 34 | 337 | 66 | 4 | 1 | 2.971 | 2 | 0.226 |
| **EI18** | 303 | 56 | 236 | 44 | 6 | 1 | 294 | 58 | 213 | 42 | 4 | 1 | 1.444 | 2 | 0.486 |
| **EI19** | 261 | 49 | 276 | 51 | 8 | 1 | 245 | 48 | 261 | 52 | 5 | 1 | 0.719 | 2 | 0.698 |
| **EI20** | 238 | 44 | 302 | 54 | 5 | 1 | 243 | 48 | 262 | 42 | 6 | 1 | 4.215 | 2 | 0.122 |

## Table F-28
## EI for female respondents

| Question | Web (N = 111) | | | | | | Paper (N = 88) | | | | | | Pearson's Chi-2 | df | sig |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | | | |
| | # | % | # | % | # | % | # | % | # | % | # | % | | | |
| **EI01** | 95 | 86 | 16 | 14 | 0 | 0 | 71 | 81 | 17 | 19 | 0 | 0 | 3.343 | 2 | 0.188 |
| **EI02** | 93 | 84 | 18 | 16 | 0 | 0 | 77 | 88 | 11 | 12 | 0 | 0 | 3.035 | 2 | 0.219 |
| **EI03** | 57 | 51 | 54 | 49 | 0 | 0 | 60 | 68 | 28 | 32 | 0 | 0 | 8.216 | 2 | 0.016 |
| **EI04** | 53 | 48 | 58 | 52 | 0 | 0 | 48 | 55 | 40 | 45 | 0 | 0 | 3.397 | 2 | 0.183 |
| **EI05** | 80 | 73 | 30 | 27 | 1 | 1 | 78 | 89 | 10 | 11 | 0 | 0 | 8.255 | 2 | 0.016 |
| **EI06** | 70 | 63 | 41 | 37 | 0 | 0 | 65 | 75 | 22 | 25 | 1 | 1 | 6.795 | 2 | 0.033 |
| **EI07** | 61 | 55 | 50 | 45 | 0 | 0 | 62 | 70 | 26 | 30 | 0 | 0 | 7.475 | 2 | 0.024 |
| **EI08** | 97 | 87 | 14 | 13 | 0 | 0 | 82 | 93 | 6 | 7 | 0 | 0 | 4.310 | 2 | 0.116 |
| **EI09** | 74 | 67 | 36 | 33 | 1 | 1 | 69 | 78 | 19 | 22 | 0 | 0 | 3.608 | 2 | 0.165 |
| **EI10** | 45 | 41 | 66 | 59 | 0 | 0 | 43 | 49 | 45 | 51 | 0 | 0 | 3.867 | 2 | 0.145 |
| **EI11** | 79 | 71 | 32 | 29 | 0 | 0 | 65 | 74 | 23 | 26 | 0 | 0 | 2.669 | 2 | 0.263 |
| **EI12** | 51 | 46 | 60 | 54 | 0 | 0 | 43 | 49 | 44 | 51 | 1 | 1 | 3.992 | 2 | 0.136 |
| **EI13** | 25 | 23 | 85 | 77 | 1 | 1 | 28 | 32 | 60 | 68 | 0 | 0 | 2.648 | 2 | 0.266 |
| **EI14** | 42 | 38 | 68 | 62 | 1 | 1 | 40 | 45 | 48 | 55 | 0 | 0 | 1.654 | 2 | 0.437 |
| **EI15** | 43 | 39 | 68 | 61 | 0 | 0 | 40 | 45 | 48 | 55 | 0 | 0 | 3.400 | 2 | 0.183 |
| **EI16*** | 49 | 44 | 62 | 56 | 0 | 0 | 56 | 64 | 32 | 36 | 0 | 0 | 9.956 | 2 | 0.007 |
| **EI17** | 33 | 30 | 78 | 70 | 0 | 0 | 32 | 36 | 56 | 64 | 0 | 0 | 3.471 | 2 | 0.176 |
| **EI18** | 22 | 20 | 89 | 80 | 0 | 0 | 28 | 32 | 60 | 68 | 0 | 0 | 6.238 | 2 | 0.044 |
| **EI19** | 40 | 36 | 71 | 64 | 0 | 0 | 36 | 41 | 52 | 59 | 0 | 0 | 2.984 | 2 | 0.225 |
| **EI20*** | 31 | 28 | 80 | 72 | 0 | 0 | 39 | 45 | 48 | 55 | 1 | 1 | 9.828 | 2 | 0.007 |

* Significant difference between paper and web ($p < .01$).

## Table F-29
## EI for majority respondents

| Question | Web (N = 347) | | | | | | Paper (N = 391) | | | | | | Pearson's Chi-2 | df | sig |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | | | |
| | # | % | # | % | # | % | # | % | # | % | # | % | | | |
| **EI01** | 308 | 89 | 39 | 11 | 0 | 0 | 360 | 92 | 31 | 8 | 0 | 0 | 2.443 | 2 | 0.295 |
| **EI02** | 328 | 95 | 19 | 5 | 0 | 0 | 363 | 93 | 28 | 7 | 0 | 0 | 0.972 | 2 | 0.615 |
| **EI03** | 240 | 69 | 107 | 31 | 0 | 0 | 259 | 66 | 132 | 34 | 0 | 0 | 0.813 | 2 | 0.666 |
| **EI04** | 262 | 76 | 85 | 24 | 0 | 0 | 300 | 77 | 91 | 23 | 0 | 0 | 0.247 | 2 | 0.884 |
| **EI05** | 310 | 89 | 37 | 11 | 0 | 0 | 343 | 88 | 48 | 12 | 0 | 0 | 0.565 | 2 | 0.754 |
| **EI06** | 270 | 78 | 75 | 22 | 2 | 1 | 312 | 80 | 78 | 20 | 1 | 0 | 0.336 | 2 | 0.845 |
| **EI07** | 265 | 76 | 81 | 23 | 1 | 0 | 312 | 80 | 78 | 20 | 1 | 0 | 1.326 | 2 | 0.515 |
| **EI08** | 326 | 94 | 21 | 6 | 0 | 0 | 362 | 93 | 29 | 7 | 0 | 0 | 0.638 | 2 | 0.727 |
| **EI09** | 306 | 88 | 38 | 11 | 3 | 1 | 334 | 85 | 57 | 15 | 0 | 0 | 2.279 | 2 | 0.320 |
| **EI10** | 254 | 73 | 91 | 26 | 2 | 1 | 310 | 79 | 81 | 21 | 0 | 0 | 3.340 | 2 | 0.188 |
| **EI11** | 295 | 85 | 52 | 15 | 0 | 0 | 334 | 85 | 57 | 15 | 0 | 0 | 0.120 | 2 | 0.942 |
| **EI12** | 223 | 64 | 124 | 36 | 0 | 0 | 254 | 65 | 133 | 34 | 4 | 1 | 1.522 | 2 | 0.467 |
| **EI13** | 128 | 37 | 219 | 63 | 0 | 0 | 154 | 39 | 236 | 60 | 1 | 0 | 0.822 | 2 | 0.663 |
| **EI14** | 231 | 67 | 114 | 33 | 2 | 1 | 248 | 63 | 142 | 36 | 1 | 0 | 0.914 | 2 | 0.633 |
| **EI15** | 232 | 67 | 115 | 33 | 1 | 0 | 266 | 68 | 125 | 32 | 0 | 0 | 0.081 | 2 | 0.960 |
| **EI16** | 254 | 73 | 93 | 27 | 0 | 0 | 289 | 74 | 102 | 26 | 0 | 0 | 0.144 | 2 | 0.931 |
| **EI17** | 126 | 36 | 220 | 63 | 1 | 0 | 132 | 34 | 256 | 65 | 3 | 1 | 0.941 | 2 | 0.625 |
| **EI18** | 196 | 56 | 150 | 43 | 1 | 0 | 234 | 60 | 155 | 40 | 2 | 1 | 1.160 | 2 | 0.560 |
| **EI19** | 163 | 47 | 182 | 52 | 2 | 1 | 185 | 47 | 202 | 52 | 4 | 1 | 0.420 | 2 | 0.810 |
| **EI20** | 154 | 44 | 193 | 56 | 0 | 0 | 196 | 50 | 191 | 49 | 4 | 1 | 4.252 | 2 | 0.119 |

## Table F-30
## EI for minority respondents

| Question | Web (N = 218) | | | | | | Paper (N = 158) | | | | | | Pearson's Chi-2 | df | sig |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | | | |
| | # | % | # | % | # | % | # | % | # | % | # | % | | | |
| **EI01*** | 175 | 80 | 43 | 20 | 0 | 0 | 122 | 78 | 35 | 22 | 1 | 1 | 12.547 | 2 | 0.002 |
| **EI02** | 189 | 87 | 28 | 13 | 1 | 0 | 143 | 91 | 15 | 9 | 0 | 0 | 9.150 | 2 | 0.010 |
| **EI03*** | 135 | 62 | 82 | 38 | 1 | 0 | 110 | 70 | 48 | 30 | 0 | 0 | 10.245 | 2 | 0.006 |
| **EI04*** | 122 | 56 | 96 | 44 | 0 | 0 | 102 | 65 | 56 | 35 | 0 | 0 | 13.445 | 2 | 0.001 |
| **EI05** | 174 | 81 | 42 | 19 | 2 | 1 | 130 | 82 | 28 | 18 | 0 | 0 | 5.854 | 2 | 0.054 |
| **EI06*** | 162 | 74 | 56 | 26 | 0 | 0 | 119 | 76 | 37 | 23 | 2 | 1 | 13.801 | 2 | 0.001 |
| **EI07*** | 150 | 69 | 68 | 31 | 0 | 0 | 114 | 72 | 44 | 28 | 0 | 0 | 11.226 | 2 | 0.004 |
| **EI08** | 194 | 89 | 23 | 11 | 1 | 0 | 143 | 91 | 15 | 9 | 0 | 0 | 8.097 | 2 | 0.017 |
| **EI09*** | 163 | 75 | 55 | 25 | 0 | 0 | 120 | 76 | 37 | 23 | 1 | 1 | 12.275 | 2 | 0.002 |
| **EI10** | 143 | 66 | 74 | 34 | 1 | 0 | 113 | 72 | 45 | 28 | 0 | 0 | 7.020 | 2 | 0.030 |
| **EI11** | 159 | 74 | 57 | 26 | 2 | 1 | 119 | 75 | 39 | 25 | 0 | 0 | 4.186 | 2 | 0.123 |
| **EI12** | 99 | 46 | 117 | 54 | 2 | 1 | 84 | 53 | 74 | 47 | 0 | 0 | 6.000 | 2 | 0.050 |
| **EI13** | 67 | 31 | 149 | 68 | 2 | 1 | 58 | 37 | 100 | 63 | 0 | 0 | 5.369 | 2 | 0.068 |
| **EI14** | 112 | 52 | 105 | 48 | 1 | 0 | 93 | 59 | 65 | 41 | 0 | 0 | 7.621 | 2 | 0.022 |
| **EI15*** | 105 | 49 | 111 | 51 | 2 | 1 | 96 | 61 | 62 | 39 | 0 | 0 | 9.437 | 2 | 0.009 |
| **EI16** | 109 | 50 | 107 | 49 | 2 | 1 | 95 | 60 | 63 | 40 | 0 | 0 | 7.467 | 2 | 0.024 |
| **EI17** | 81 | 38 | 135 | 62 | 2 | 1 | 57 | 36 | 101 | 64 | 0 | 0 | 4.127 | 2 | 0.127 |
| **EI18** | 82 | 38 | 132 | 61 | 4 | 2 | 60 | 38 | 97 | 61 | 1 | 1 | 2.655 | 2 | 0.265 |
| **EI19** | 98 | 46 | 115 | 53 | 5 | 2 | 70 | 44 | 88 | 56 | 0 | 0 | 1.272 | 2 | 0.530 |
| **EI20** | 74 | 35 | 140 | 64 | 4 | 2 | 63 | 40 | 94 | 59 | 1 | 1 | 3.846 | 2 | 0.146 |

* Significant difference between paper and web ($p < .01$).

## Table F-31
## AS for all respondents

| | Web (N = 731) | | | | | | Paper (N = 646) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | Pearson's | | |
| Question | # | % | # | % | # | % | # | % | # | % | # | % | Chi-2 | df | sig |
| **AS01** | 506 | 69 | 224 | 31 | 1 | 0 | 459 | 71 | 187 | 29 | 0 | 0 | 4.766 | 2 | 0.092 |
| **AS02** | 628 | 86 | 103 | 14 | 0 | 0 | 565 | 87 | 81 | 13 | 0 | 0 | 4.740 | 2 | 0.093 |
| **AS03** | 642 | 88 | 89 | 12 | 0 | 0 | 576 | 89 | 70 | 11 | 0 | 0 | 4.747 | 2 | 0.093 |
| **AS04** | 429 | 59 | 301 | 41 | 1 | 0 | 379 | 59 | 266 | 41 | 1 | 0 | 3.178 | 2 | 0.204 |
| **AS05** | 564 | 77 | 166 | 23 | 1 | 0 | 534 | 83 | 112 | 17 | 0 | 0 | 8.879 | 2 | 0.012 |
| **AS06** | 400 | 55 | 327 | 45 | 4 | 0 | 370 | 57 | 273 | 43 | 3 | 0 | 3.037 | 2 | 0.219 |
| **AS07** | 522 | 71 | 208 | 29 | 1 | 0 | 489 | 76 | 157 | 24 | 0 | 0 | 5.497 | 2 | 0.064 |
| **AS08** | 565 | 77 | 166 | 23 | 0 | 0 | 491 | 76 | 151 | 24 | 4 | 0 | 6.241 | 2 | 0.044 |
| **AS09** | 295 | 40 | 433 | 60 | 3 | 0 | 237 | 37 | 409 | 63 | 0 | 0 | 4.208 | 2 | 0.122 |
| **AS10** | 511 | 70 | 217 | 30 | 3 | 0 | 464 | 72 | 182 | 28 | 0 | 0 | 2.493 | 2 | 0.287 |
| **AS11*** | 474 | 65 | 256 | 35 | 1 | 0 | 482 | 75 | 162 | 25 | 2 | 0 | 20.782 | 2 | 0.000 |
| **AS12** | 448 | 61 | 282 | 39 | 1 | 0 | 400 | 62 | 245 | 38 | 1 | 0 | 2.605 | 2 | 0.272 |
| **AS13** | 373 | 51 | 354 | 49 | 4 | 0 | 345 | 53 | 299 | 47 | 2 | 0 | 2.571 | 2 | 0.277 |
| **AS14** | 571 | 78 | 157 | 22 | 3 | 0 | 508 | 79 | 137 | 21 | 1 | 0 | 1.936 | 2 | 0.380 |
| **AS15** | 459 | 63 | 271 | 37 | 1 | 0 | 424 | 66 | 221 | 34 | 1 | 0 | 4.513 | 2 | 0.105 |
| **AS16** | 293 | 40 | 432 | 60 | 6 | 0 | 285 | 44 | 356 | 56 | 5 | 0 | 4.491 | 2 | 0.106 |
| **AS17** | 313 | 43 | 412 | 57 | 6 | 0 | 263 | 41 | 381 | 59 | 2 | 0 | 1.504 | 2 | 0.471 |
| **AS18** | 287 | 39 | 440 | 61 | 4 | 0 | 269 | 42 | 373 | 58 | 4 | 0 | 2.621 | 2 | 0.270 |
| **AS19** | 310 | 42 | 414 | 58 | 7 | 0 | 266 | 41 | 370 | 59 | 10 | 1 | 3.130 | 2 | 0.209 |
| **AS20** | 289 | 40 | 434 | 60 | 8 | 1 | 259 | 40 | 377 | 60 | 10 | 1 | 2.530 | 2 | 0.282 |
| **AS21** | 264 | 36 | 457 | 64 | 10 | 1 | 245 | 38 | 391 | 62 | 10 | 1 | 2.485 | 2 | 0.289 |

## Table F-31
## AS for all respondents

| Question | Web (N = 731) | | | | | | Paper (N = 646) | | | | | | Pearson's Chi-2 | df | sig |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | | | |
| | # | % | # | % | # | % | # | % | # | % | # | % | | | |
| **AS22** | 258 | 35 | 462 | 65 | 11 | 1 | 236 | 37 | 397 | 63 | 13 | 2 | 3.556 | 2 | 0.169 |
| **AS23** | 229 | 31 | 490 | 69 | 12 | 1 | 220 | 34 | 412 | 66 | 14 | 2 | 4.026 | 2 | 0.134 |
| **AS24** | 303 | 41 | 413 | 59 | 15 | 2 | 250 | 39 | 379 | 61 | 17 | 2 | 3.998 | 2 | 0.135 |
| **AS25** | 257 | 35 | 464 | 65 | 10 | 1 | 247 | 38 | 382 | 62 | 17 | 2 | 7.411 | 2 | 0.025 |

* Significant difference between paper and web ($p < .01$).

## Table F-32
## AS for male respondents

| | Web (N = 543) | | | | | | Paper (N = 510) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | Pearson's | | |
| Question | # | % | # | % | # | % | # | % | # | % | # | % | Chi-2 | df | sig |
| **AS01** | 398 | 73 | 144 | 27 | 1 | 0 | 376 | 74 | 134 | 26 | 0 | 0 | 1.867 | 2 | 0.393 |
| **AS02** | 483 | 89 | 60 | 11 | 0 | 0 | 450 | 88 | 60 | 12 | 0 | 0 | 1.992 | 2 | 0.369 |
| **AS03** | 502 | 92 | 41 | 8 | 0 | 0 | 466 | 91 | 44 | 9 | 0 | 0 | 2.269 | 2 | 0.322 |
| **AS04** | 349 | 64 | 194 | 36 | 0 | 0 | 322 | 63 | 187 | 37 | 1 | 0 | 1.890 | 2 | 0.389 |
| **AS05** | 419 | 77 | 123 | 23 | 1 | 0 | 421 | 83 | 89 | 17 | 0 | 0 | 5.489 | 2 | 0.064 |
| **AS06** | 326 | 60 | 214 | 40 | 3 | 1 | 318 | 63 | 189 | 37 | 3 | 1 | 1.663 | 2 | 0.435 |
| **AS07** | 430 | 79 | 112 | 21 | 1 | 0 | 414 | 81 | 96 | 19 | 0 | 0 | 1.330 | 2 | 0.514 |
| **AS08** | 440 | 81 | 103 | 19 | 0 | 0 | 401 | 79 | 105 | 21 | 4 | 1 | 3.971 | 2 | 0.137 |
| **AS09** | 229 | 42 | 312 | 58 | 2 | 0 | 202 | 40 | 308 | 60 | 0 | 0 | 1.657 | 2 | 0.437 |
| **AS10** | 370 | 69 | 170 | 31 | 3 | 1 | 368 | 72 | 142 | 28 | 0 | 0 | 2.346 | 2 | 0.309 |
| **AS11*** | 375 | 69 | 167 | 31 | 1 | 0 | 394 | 78 | 114 | 22 | 2 | 0 | 11.223 | 2 | 0.004 |
| **AS12** | 348 | 64 | 194 | 36 | 1 | 0 | 331 | 65 | 178 | 35 | 1 | 0 | 1.316 | 2 | 0.518 |
| **AS13** | 302 | 56 | 238 | 44 | 3 | 1 | 286 | 56 | 223 | 44 | 1 | 0 | 0.819 | 2 | 0.664 |
| **AS14** | 426 | 79 | 116 | 21 | 1 | 0 | 396 | 78 | 113 | 22 | 1 | 0 | 1.843 | 2 | 0.398 |
| **AS15** | 358 | 66 | 184 | 34 | 1 | 0 | 338 | 66 | 171 | 34 | 1 | 0 | 1.760 | 2 | 0.415 |
| **AS16** | 241 | 45 | 299 | 55 | 3 | 1 | 244 | 48 | 262 | 52 | 4 | 1 | 3.365 | 2 | 0.186 |
| **AS17** | 253 | 47 | 286 | 53 | 4 | 1 | 214 | 42 | 294 | 58 | 2 | 0 | 3.012 | 2 | 0.222 |
| **AS18** | 240 | 44 | 301 | 56 | 2 | 0 | 233 | 46 | 273 | 54 | 4 | 1 | 2.281 | 2 | 0.320 |
| **AS19** | 243 | 45 | 297 | 55 | 3 | 1 | 219 | 44 | 283 | 56 | 8 | 2 | 3.642 | 2 | 0.162 |
| **AS20** | 240 | 45 | 297 | 55 | 6 | 1 | 228 | 45 | 274 | 55 | 8 | 2 | 1.766 | 2 | 0.414 |
| **AS21** | 219 | 41 | 318 | 59 | 6 | 1 | 207 | 41 | 296 | 59 | 7 | 1 | 1.775 | 2 | 0.412 |

## Table F-32
## AS for male respondents

| | Web (N = 543) | | | | | | Paper (N = 510) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | Pearson's | | |
| Question | # | % | # | % | # | % | # | % | # | % | # | % | Chi-2 | df | sig |
| **AS22** | 218 | 41 | 317 | 59 | 8 | 1 | 208 | 42 | 292 | 58 | 10 | 2 | 2.610 | 2 | 0.271 |
| **AS23** | 179 | 34 | 355 | 66 | 9 | 2 | 187 | 38 | 311 | 62 | 12 | 2 | 4.208 | 2 | 0.122 |
| **AS24** | 247 | 46 | 287 | 54 | 9 | 2 | 207 | 42 | 289 | 58 | 14 | 3 | 5.432 | 2 | 0.066 |
| **AS25** | 207 | 39 | 329 | 61 | 7 | 1 | 204 | 41 | 292 | 59 | 14 | 3 | 5.308 | 2 | 0.070 |

* Significant difference between paper and web ($p < .01$).

## Table F-33
## AS for female respondents

| Question | Web (N = 110) | | | | | | Paper (N = 88) | | | | | | Pearson's Chi-2 | df | sig |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | | | |
| | # | % | # | % | # | % | # | % | # | % | # | % | | | |
| **AS01** | 58 | 53 | 52 | 47 | 0 | 0 | 53 | 60 | 35 | 40 | 0 | 0 | 3.754 | 2 | 0.153 |
| **AS02** | 84 | 76 | 26 | 24 | 0 | 0 | 75 | 85 | 13 | 15 | 0 | 0 | 4.817 | 2 | 0.090 |
| **AS03** | 77 | 70 | 33 | 30 | 0 | 0 | 66 | 75 | 22 | 25 | 0 | 0 | 3.039 | 2 | 0.219 |
| **AS04** | 42 | 38 | 68 | 62 | 0 | 0 | 31 | 35 | 57 | 65 | 0 | 0 | 2.750 | 2 | 0.253 |
| **AS05** | 83 | 75 | 27 | 25 | 0 | 0 | 72 | 82 | 16 | 18 | 0 | 0 | 3.582 | 2 | 0.167 |
| **AS06** | 34 | 31 | 76 | 69 | 0 | 0 | 30 | 34 | 58 | 66 | 0 | 0 | 2.637 | 2 | 0.267 |
| **AS07** | 40 | 36 | 70 | 64 | 0 | 0 | 43 | 49 | 45 | 51 | 0 | 0 | 5.347 | 2 | 0.069 |
| **AS08** | 68 | 62 | 42 | 38 | 0 | 0 | 68 | 77 | 30 | 23 | 0 | 0 | 2.947 | 2 | 0.229 |
| **AS09** | 26 | 24 | 84 | 76 | 0 | 0 | 20 | 23 | 68 | 77 | 0 | 0 | 2.505 | 2 | 0.286 |
| **AS10** | 82 | 75 | 28 | 25 | 0 | 0 | 60 | 68 | 28 | 32 | 0 | 0 | 3.544 | 2 | 0.170 |
| **AS11** | 53 | 48 | 57 | 52 | 0 | 0 | 58 | 66 | 30 | 34 | 0 | 0 | 9.039 | 2 | 0.011 |
| **AS12** | 53 | 48 | 57 | 52 | 0 | 0 | 43 | 49 | 45 | 51 | 0 | 0 | 2.516 | 2 | 0.284 |
| **AS13** | 35 | 32 | 75 | 68 | 0 | 0 | 40 | 45 | 48 | 55 | 0 | 0 | 6.533 | 2 | 0.038 |
| **AS14** | 83 | 76 | 26 | 24 | 1 | 1 | 71 | 81 | 17 | 19 | 0 | 0 | 1.126 | 2 | 0.570 |
| **AS15** | 57 | 52 | 53 | 48 | 0 | 0 | 58 | 66 | 30 | 34 | 0 | 0 | 6.745 | 2 | 0.034 |
| **AS16** | 23 | 21 | 85 | 79 | 2 | 2 | 28 | 32 | 60 | 68 | 0 | 0 | 2.959 | 2 | 0.228 |
| **AS17** | 29 | 27 | 80 | 73 | 1 | 1 | 25 | 28 | 63 | 72 | 0 | 0 | 0.693 | 2 | 0.707 |
| **AS18** | 14 | 13 | 95 | 87 | 1 | 1 | 19 | 22 | 69 | 78 | 0 | 0 | 2.715 | 2 | 0.257 |
| **AS19** | 34 | 31 | 74 | 69 | 2 | 2 | 27 | 31 | 60 | 69 | 1 | 1 | 0.073 | 2 | 0.964 |
| **AS20** | 25 | 23 | 84 | 77 | 1 | 1 | 15 | 17 | 72 | 83 | 1 | 1 | 1.445 | 2 | 0.486 |
| **AS21** | 18 | 17 | 90 | 83 | 2 | 2 | 19 | 22 | 68 | 78 | 1 | 1 | 0.906 | 2 | 0.636 |

## Table F-33
## AS for female respondents

| Question | Web (N = 110) | | | | | | Paper (N = 88) | | | | | | Pearson's Chi-2 | df | sig |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | | | |
| | # | % | # | % | # | % | # | % | # | % | # | % | | | |
| **AS22** | 22 | 20 | 87 | 80 | 1 | 1 | 18 | 21 | 69 | 79 | 1 | 1 | 0.488 | 2 | 0.783 |
| **AS23** | 24 | 22 | 84 | 78 | 2 | 2 | 18 | 21 | 69 | 79 | 1 | 1 | 0.135 | 2 | 0.935 |
| **AS24** | 22 | 21 | 85 | 79 | 3 | 3 | 23 | 27 | 63 | 73 | 2 | 2 | 1.111 | 2 | 0.574 |
| **AS25** | 25 | 23 | 84 | 77 | 1 | 1 | 24 | 28 | 63 | 72 | 1 | 1 | 1.038 | 2 | 0.595 |

## Table F-34
## AS for majority respondents

| | Web (N = 346) | | | | | | Paper (N = 390) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | Pearson's | | |
| Question | # | | # | % | # | % | # | % | # | % | # | % | Chi-2 | df | sig |
| **AS01** | 262 | 76 | 84 | 24 | 0 | 0 | 297 | 76 | 93 | 24 | 0 | 0 | 0.338 | 2 | 0.844 |
| **AS02** | 315 | 91 | 31 | 9 | 0 | 0 | 350 | 90 | 40 | 10 | 0 | 0 | 0.665 | 2 | 0.717 |
| **AS03** | 328 | 95 | 18 | 5 | 0 | 0 | 365 | 94 | 25 | 6 | 0 | 0 | 0.796 | 2 | 0.672 |
| **AS04** | 219 | 63 | 127 | 37 | 0 | 0 | 239 | 61 | 150 | 38 | 1 | 0 | 0.501 | 2 | 0.779 |
| **AS05** | 299 | 86 | 47 | 14 | 0 | 0 | 335 | 86 | 55 | 14 | 0 | 0 | 0.344 | 2 | 0.842 |
| **AS06** | 221 | 64 | 124 | 36 | 1 | 0 | 259 | 66 | 129 | 33 | 2 | 1 | 0.770 | 2 | 0.680 |
| **AS07** | 260 | 75 | 85 | 25 | 1 | 0 | 312 | 80 | 78 | 20 | 0 | 0 | 2.281 | 2 | 0.320 |
| **AS08** | 283 | 82 | 63 | 18 | 0 | 0 | 320 | 82 | 68 | 17 | 2 | 1 | 0.538 | 2 | 0.764 |
| **AS09** | 150 | 43 | 195 | 56 | 1 | 0 | 159 | 41 | 231 | 59 | 0 | 0 | 0.569 | 2 | 0.752 |
| **AS10** | 243 | 70 | 101 | 29 | 2 | 1 | 281 | 72 | 109 | 28 | 0 | 0 | 0.234 | 2 | 0.890 |
| **AS11** | 267 | 77 | 79 | 23 | 0 | 0 | 326 | 84 | 63 | 16 | 1 | 0 | 5.674 | 2 | 0.059 |
| **AS12** | 210 | 61 | 136 | 39 | 0 | 0 | 249 | 64 | 139 | 36 | 1 | 0 | 1.091 | 2 | 0.579 |
| **AS13** | 210 | 61 | 135 | 39 | 1 | 0 | 229 | 59 | 161 | 41 | 0 | 0 | 0.458 | 2 | 0.795 |
| **AS14** | 272 | 79 | 74 | 21 | 0 | 0 | 313 | 80 | 76 | 19 | 1 | 0 | 0.947 | 2 | 0.623 |
| **AS15** | 233 | 67 | 113 | 33 | 0 | 0 | 270 | 69 | 119 | 31 | 1 | 0 | 1.019 | 2 | 0.601 |
| **AS16** | 169 | 49 | 175 | 51 | 2 | 1 | 195 | 50 | 191 | 49 | 4 | 1 | 0.850 | 2 | 0.654 |
| **AS17** | 160 | 46 | 183 | 53 | 3 | 1 | 169 | 43 | 219 | 56 | 2 | 1 | 0.707 | 2 | 0.702 |
| **AS18** | 163 | 47 | 183 | 53 | 0 | 0 | 174 | 45 | 213 | 55 | 3 | 1 | 1.138 | 2 | 0.566 |
| **AS19** | 153 | 44 | 191 | 55 | 2 | 1 | 172 | 44 | 212 | 54 | 6 | 2 | 0.895 | 2 | 0.639 |
| **AS20** | 163 | 47 | 182 | 53 | 1 | 0 | 186 | 48 | 198 | 51 | 6 | 2 | 1.512 | 2 | 0.470 |
| **AS21** | 149 | 43 | 196 | 57 | 1 | 0 | 165 | 42 | 222 | 57 | 3 | 1 | 0.420 | 2 | 0.810 |

## Table F-34
## AS for majority respondents

| Question | Web (N = 346) | | | | | | Paper (N = 390) | | | | | | Pearson's Chi-2 | df | sig |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | | | |
| | # | | # | % | # | % | # | % | # | % | # | % | | | |
| **AS22** | 144 | 42 | 198 | 57 | 4 | 1 | 162 | 42 | 221 | 57 | 7 | 2 | 0.778 | 2 | 0.678 |
| **AS23** | 128 | 37 | 217 | 63 | 1 | 0 | 149 | 38 | 233 | 60 | 8 | 2 | 2.597 | 2 | 0.273 |
| **AS24** | 160 | 46 | 183 | 53 | 3 | 1 | 161 | 41 | 219 | 56 | 10 | 3 | 3.218 | 2 | 0.200 |
| **AS25** | 151 | 44 | 194 | 56 | 1 | 0 | 157 | 40 | 223 | 57 | 10 | 3 | 3.816 | 2 | 0.148 |

## Table F-35
## AS for minority respondents

| Question | Web (N = 217) | | | | | | Paper (N = 158) | | | | | | Pearson's Chi-2 | df | sig |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | | | |
| | # | % | # | % | # | % | # | % | # | % | # | % | | | |
| AS01 | 136 | 63 | 80 | 37 | 1 | 0 | 96 | 61 | 62 | 39 | 0 | 0 | 5.836 | 2 | 0.054 |
| AS02 | 174 | 80 | 43 | 20 | 0 | 0 | 131 | 83 | 27 | 17 | 0 | 0 | 8.289 | 2 | 0.016 |
| AS03 | 174 | 80 | 43 | 20 | 0 | 0 | 121 | 77 | 37 | 23 | 0 | 0 | 8.613 | 2 | 0.013 |
| AS04 | 118 | 54 | 99 | 46 | 0 | 0 | 83 | 53 | 75 | 47 | 0 | 0 | 8.027 | 2 | 0.018 |
| AS05 | 134 | 62 | 82 | 38 | 1 | 0 | 114 | 72 | 44 | 28 | 0 | 0 | 9.719 | 2 | 0.008 |
| AS06 | 92 | 43 | 124 | 57 | 1 | 0 | 67 | 43 | 90 | 57 | 1 | 1 | 6.916 | 2 | 0.031 |
| AS07 | 145 | 67 | 72 | 33 | 0 | 0 | 105 | 66 | 53 | 34 | 0 | 0 | 7.883 | 2 | 0.019 |
| AS08 * | 154 | 71 | 63 | 29 | 0 | 0 | 105 | 67 | 52 | 33 | 1 | 1 | 9.801 | 2 | 0.007 |
| AS09 | 74 | 34 | 143 | 66 | 0 | 0 | 46 | 29 | 112 | 71 | 0 | 0 | 8.849 | 2 | 0.012 |
| AS10 | 143 | 66 | 73 | 34 | 1 | 0 | 110 | 70 | 48 | 30 | 0 | 0 | 6.137 | 2 | 0.046 |
| AS11 | 106 | 49 | 110 | 51 | 1 | 0 | 88 | 56 | 69 | 44 | 1 | 1 | 8.795 | 2 | 0.012 |
| AS12 | 132 | 61 | 84 | 39 | 1 | 0 | 89 | 56 | 69 | 44 | 0 | 0 | 6.455 | 2 | 0.040 |
| AS13 | 79 | 37 | 136 | 63 | 2 | 1 | 71 | 45 | 86 | 54 | 1 | 1 | 7.945 | 2 | 0.019 |
| AS14 | 166 | 77 | 49 | 23 | 2 | 1 | 112 | 71 | 46 | 29 | 0 | 0 | 6.028 | 2 | 0.049 |
| AS15 | 126 | 58 | 90 | 41 | 1 | 0 | 91 | 58 | 67 | 42 | 0 | 0 | 5.703 | 2 | 0.058 |
| AS16 | 61 | 28 | 154 | 71 | 2 | 1 | 50 | 32 | 108 | 68 | 0 | 0 | 4.552 | 2 | 0.103 |
| AS17 * | 91 | 42 | 125 | 58 | 1 | 0 | 46 | 29 | 112 | 71 | 0 | 0 | 12.138 | 2 | 0.002 |
| AS18 | 58 | 27 | 157 | 72 | 2 | 1 | 59 | 37 | 99 | 63 | 0 | 0 | 7.325 | 2 | 0.026 |
| AS19 | 80 | 37 | 135 | 62 | 2 | 1 | 57 | 36 | 101 | 64 | 0 | 0 | 2.851 | 2 | 0.240 |
| AS20 | 63 | 29 | 152 | 70 | 2 | 1 | 39 | 25 | 118 | 75 | 1 | 1 | 4.644 | 2 | 0.098 |
| AS21 | 57 | 27 | 156 | 72 | 4 | 2 | 39 | 25 | 117 | 74 | 2 | 1 | 2.702 | 2 | 0.259 |

## Table F-35
## AS for minority respondents

| Question | Web (N = 217) | | | | | | Paper (N = 158) | | | | | | Pearson's Chi-2 | df | sig |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | | | |
| | # | % | # | % | # | % | # | % | # | % | # | % | | | |
| AS22 | 59 | 27 | 156 | 72 | 2 | 1 | 45 | 29 | 111 | 70 | 2 | 1 | 4.836 | 2 | 0.089 |
| AS23 | 50 | 24 | 161 | 74 | 6 | 3 | 41 | 26 | 116 | 73 | 1 | 1 | 0.982 | 2 | 0.612 |
| AS24 | 76 | 36 | 135 | 62 | 6 | 3 | 54 | 35 | 102 | 65 | 2 | 1 | 1.268 | 2 | 0.530 |
| AS25 | 53 | 25 | 160 | 74 | 4 | 2 | 54 | 35 | 102 | 65 | 2 | 1 | 6.680 | 2 | 0.035 |

* Significant difference between paper and web ($p < .01$).

## Table F-36
## MC for all respondents

| Question | Web (N = 726) | | | | | | Paper (N = 646) | | | | | | Pearson's Chi-2 | df | sig |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | | | |
| | # | % | # | % | # | % | # | % | # | % | # | % | | | |
| **MC01** | 500 | 69 | 220 | 31 | 6 | 0 | 479 | 74 | 164 | 26 | 3 | 0 | 5.242 | 2 | 0.073 |
| **MC02*** | 605 | 83 | 121 | 17 | 0 | 0 | 580 | 90 | 66 | 10 | 0 | 0 | 14.855 | 2 | 0.001 |
| **MC03** | 657 | 91 | 67 | 9 | 2 | 0 | 608 | 94 | 38 | 6 | 0 | 0 | 6.050 | 2 | 0.049 |
| **MC04** | 549 | 76 | 175 | 24 | 2 | 0 | 519 | 81 | 125 | 19 | 2 | 0 | 6.208 | 2 | 0.045 |
| **MC05** | 457 | 63 | 266 | 37 | 3 | 0 | 433 | 67 | 213 | 33 | 0 | 0 | 2.682 | 2 | 0.262 |
| **MC06** | 476 | 66 | 248 | 34 | 2 | 0 | 448 | 69 | 197 | 31 | 1 | 0 | 3.393 | 2 | 0.183 |
| **MC07** | 615 | 85 | 109 | 15 | 2 | 0 | 572 | 89 | 74 | 11 | 0 | 0 | 4.500 | 2 | 0.105 |
| **MC08** | 504 | 70 | 221 | 30 | 1 | 0 | 462 | 72 | 184 | 28 | 0 | 0 | 1.754 | 2 | 0.416 |
| **MC09** | 485 | 67 | 239 | 33 | 2 | 0 | 472 | 73 | 174 | 27 | 0 | 0 | 7.067 | 2 | 0.029 |
| **MC10** | 427 | 59 | 295 | 41 | 4 | 0 | 370 | 57 | 275 | 43 | 1 | 0 | 0.727 | 2 | 0.695 |
| **MC11*** | 416 | 58 | 306 | 42 | 4 | 0 | 427 | 66 | 219 | 34 | 0 | 0 | 10.070 | 2 | 0.007 |
| **MC12** | 443 | 61 | 281 | 39 | 2 | 0 | 443 | 69 | 201 | 31 | 2 | 0 | 8.587 | 2 | 0.014 |
| **MC13** | 511 | 71 | 213 | 29 | 2 | 0 | 474 | 74 | 170 | 26 | 2 | 0 | 1.899 | 2 | 0.387 |
| **MC14** | 487 | 67 | 237 | 33 | 2 | 0 | 456 | 71 | 186 | 29 | 4 | 0 | 1.913 | 2 | 0.384 |
| **MC15** | 239 | 33 | 486 | 67 | 1 | 0 | 251 | 39 | 393 | 61 | 2 | 0 | 5.975 | 2 | 0.050 |
| **MC16** | 504 | 70 | 219 | 30 | 3 | 0 | 474 | 74 | 169 | 26 | 3 | 0 | 2.878 | 2 | 0.237 |
| **MC17** | 434 | 60 | 287 | 40 | 5 | 0 | 406 | 63 | 236 | 37 | 4 | 0 | 0.677 | 2 | 0.713 |
| **MC18** | 386 | 53 | 336 | 47 | 4 | 0 | 344 | 54 | 297 | 46 | 5 | 0 | 0.700 | 2 | 0.705 |
| **MC19** | 501 | 70 | 216 | 30 | 9 | 1 | 482 | 75 | 158 | 25 | 6 | 0 | 4.893 | 2 | 0.087 |
| **MC20** | 355 | 49 | 363 | 51 | 8 | 1 | 341 | 53 | 298 | 47 | 7 | 1 | 2.443 | 2 | 0.295 |
| **MC21** | 471 | 66 | 245 | 34 | 10 | 1 | 440 | 69 | 196 | 31 | 10 | 1 | 1.891 | 2 | 0.389 |

## Table F-36
## MC for all respondents

| | Web (N = 726) | | | | | | Paper (N = 646) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | Pearson's | | |
| Question | # | % | # | % | # | % | # | % | # | % | # | % | Chi-2 | df | sig |
| **MC22** | 411 | 58 | 300 | 42 | 15 | 2 | 405 | 64 | 229 | 36 | 12 | 1 | 5.136 | 2 | 0.077 |
| **MC23** | 345 | 49 | 362 | 51 | 19 | 2 | 306 | 49 | 322 | 51 | 18 | 2 | 0.359 | 2 | 0.836 |
| **MC24** | 350 | 50 | 356 | 50 | 20 | 2 | 345 | 55 | 286 | 45 | 15 | 2 | 3.384 | 2 | 0.184 |
| **MC25*** | 336 | 48 | 361 | 52 | 29 | 4 | 358 | 57 | 268 | 43 | 20 | 3 | 10.699 | 2 | 0.005 |

* Significant difference between paper and web ($p < .01$).

## Table F-37
## MC for male respondents

| Question | Web (N = 539) | | | | | | Paper (N =5 10) | | | | | | Pearson's Chi-2 | df | sig |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | | | |
| | # | % | # | % | # | % | # | % | # | % | # | % | | | |
| **MC01** | 379 | 71 | 154 | 29 | 6 | 1 | 383 | 76 | 124 | 24 | 3 | 1 | 3.044 | 2 | 0.218 |
| **MC02*** | 459 | 85 | 80 | 15 | 0 | 0 | 463 | 91 | 47 | 8 | 0 | 0 | 9.862 | 2 | 0.007 |
| **MC03** | 491 | 91 | 46 | 9 | 2 | 0 | 480 | 94 | 30 | 6 | 0 | 0 | 2.889 | 2 | 0.236 |
| **MC04*** | 410 | 76 | 128 | 24 | 1 | 0 | 423 | 83 | 85 | 17 | 2 | 0 | 9.415 | 2 | 0.009 |
| **MC05** | 361 | 67 | 176 | 33 | 2 | 0 | 351 | 69 | 159 | 31 | 0 | 0 | 0.600 | 2 | 0.741 |
| **MC06** | 378 | 70 | 159 | 30 | 2 | 0 | 365 | 72 | 144 | 28 | 1 | 0 | 0.887 | 2 | 0.642 |
| **MC07** | 456 | 85 | 81 | 15 | 2 | 0 | 455 | 89 | 55 | 11 | 0 | 0 | 4.316 | 2 | 0.116 |
| **MC08** | 395 | 73 | 143 | 27 | 1 | 0 | 374 | 73 | 136 | 27 | 0 | 0 | 0.519 | 2 | 0.772 |
| **MC09** | 366 | 68 | 171 | 32 | 2 | 0 | 376 | 74 | 134 | 26 | 0 | 0 | 4.297 | 2 | 0.117 |
| **MC10** | 338 | 63 | 197 | 37 | 4 | 1 | 301 | 59 | 208 | 41 | 1 | 0 | 1.879 | 2 | 0.391 |
| **MC11*** | 324 | 60 | 212 | 40 | 3 | 1 | 356 | 70 | 154 | 30 | 0 | 0 | 9.932 | 2 | 0.007 |
| **MC12** | 334 | 62 | 203 | 38 | 2 | 0 | 359 | 71 | 149 | 29 | 2 | 0 | 8.286 | 2 | 0.016 |
| **MC13** | 397 | 74 | 140 | 26 | 2 | 0 | 387 | 76 | 121 | 24 | 2 | 0 | 0.959 | 2 | 0.619 |
| **MC14** | 377 | 70 | 160 | 30 | 2 | 0 | 368 | 72 | 140 | 28 | 2 | 0 | 0.773 | 2 | 0.679 |
| **MC15** | 187 | 35 | 352 | 65 | 0 | 0 | 214 | 42 | 296 | 58 | 0 | 0 | 5.827 | 2 | 0.054 |
| **MC16** | 391 | 73 | 145 | 27 | 3 | 1 | 378 | 74 | 131 | 26 | 1 | 0 | 0.251 | 2 | 0.882 |
| **MC17** | 353 | 66 | 183 | 34 | 3 | 1 | 338 | 66 | 171 | 34 | 1 | 0 | 0.022 | 2 | 0.989 |
| **MC18** | 300 | 56 | 236 | 44 | 3 | 1 | 282 | 56 | 225 | 44 | 3 | 1 | 0.112 | 2 | 0.946 |
| **MC19** | 384 | 72 | 149 | 28 | 6 | 1 | 390 | 77 | 117 | 23 | 3 | 1 | 3.103 | 2 | 0.212 |
| **MC20** | 275 | 52 | 258 | 48 | 6 | 1 | 287 | 57 | 219 | 43 | 4 | 1 | 2.640 | 2 | 0.267 |
| **MC21** | 368 | 69 | 164 | 31 | 7 | 1 | 363 | 72 | 140 | 28 | 7 | 1 | 1.127 | 2 | 0.569 |

## Table F-37
## MC for male respondents

| Question | Web (N = 539) | | | | | | Paper (N =5 10) | | | | | | Pearson's Chi-2 | df | sig |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | | | |
| | # | % | # | % | # | % | # | % | # | % | # | % | | | |
| **MC22** | 325 | 61 | 204 | 39 | 10 | 2 | 337 | 67 | 164 | 33 | 9 | 1 | 3.912 | 2 | 0.141 |
| **MC23** | 261 | 50 | 262 | 50 | 16 | 3 | 250 | 51 | 245 | 49 | 15 | 3 | 0.147 | 2 | 0.929 |
| **MC24** | 276 | 53 | 246 | 47 | 17 | 3 | 284 | 57 | 213 | 43 | 13 | 2 | 1.880 | 2 | 0.391 |
| **MC25*** | 267 | 52 | 248 | 48 | 24 | 4 | 304 | 61 | 191 | 39 | 15 | 3 | 9.918 | 2 | 0.007 |

* Significant difference between paper and web ($p < .01$).

## Table F-38
## MC for female respondents

| Question | Web (N = 109) | | | | | | Paper (N = 88) | | | | | | Pearson's chi-2 | df | sig |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | | | |
| | # | % | # | % | # | % | # | % | # | % | # | % | | | |
| **MC01** | 69 | 63 | 40 | 37 | 0 | 0 | 61 | 69 | 27 | 31 | 0 | 0 | 1.531 | 2 | 0.465 |
| **MC02** | 79 | 72 | 30 | 28 | 0 | 0 | 76 | 86 | 12 | 14 | 0 | 0 | 6.665 | 2 | 0.036 |
| **MC03** | 93 | 85 | 16 | 15 | 0 | 0 | 83 | 94 | 5 | 6 | 0 | 0 | 4.635 | 2 | 0.098 |
| **MC04** | 76 | 70 | 33 | 30 | 0 | 0 | 63 | 72 | 25 | 28 | 0 | 0 | 0.736 | 2 | 0.692 |
| **MC05** | 51 | 47 | 57 | 53 | 1 | 1 | 54 | 61 | 34 | 39 | 0 | 0 | 3.697 | 2 | 0.157 |
| **MC06** | 50 | 46 | 59 | 54 | 0 | 0 | 58 | 66 | 30 | 34 | 0 | 0 | 8.127 | 2 | 0.017 |
| **MC07** | 90 | 83 | 19 | 17 | 0 | 0 | 76 | 86 | 12 | 14 | 0 | 0 | 1.079 | 2 | 0.583 |
| **MC08** | 61 | 56 | 48 | 44 | 0 | 0 | 57 | 65 | 31 | 35 | 0 | 0 | 2.351 | 2 | 0.309 |
| **MC09** | 68 | 62 | 41 | 38 | 0 | 0 | 66 | 75 | 22 | 25 | 0 | 0 | 4.468 | 2 | 0.107 |
| **MC10** | 43 | 39 | 66 | 61 | 0 | 0 | 43 | 49 | 45 | 51 | 0 | 0 | 2.147 | 2 | 0.342 |
| **MC11** | 46 | 43 | 62 | 57 | 1 | 1 | 44 | 50 | 44 | 50 | 0 | 0 | 1.119 | 2 | 0.571 |
| **MC12** | 55 | 50 | 54 | 50 | 0 | 0 | 53 | 60 | 35 | 40 | 0 | 0 | 1.920 | 2 | 0.383 |
| **MC13** | 64 | 59 | 45 | 41 | 0 | 0 | 60 | 68 | 28 | 32 | 0 | 0 | 1.915 | 2 | 0.384 |
| **MC14** | 62 | 57 | 47 | 43 | 0 | 0 | 57 | 66 | 30 | 34 | 1 | 1 | 1.991 | 2 | 0.370 |
| **MC15** | 22 | 20 | 86 | 80 | 1 | 1 | 23 | 26 | 64 | 74 | 1 | 1 | 1.067 | 2 | 0.587 |
| **MC16** | 66 | 61 | 43 | 39 | 0 | 0 | 62 | 71 | 25 | 29 | 1 | 1 | 2.928 | 2 | 0.231 |
| **MC17** | 34 | 32 | 73 | 68 | 2 | 2 | 32 | 37 | 54 | 63 | 2 | 1 | 0.717 | 2 | 0.699 |
| **MC18** | 45 | 42 | 63 | 58 | 1 | 1 | 41 | 47 | 46 | 53 | 1 | 1 | 0.650 | 2 | 0.722 |
| **MC19** | 64 | 60 | 43 | 40 | 2 | 2 | 62 | 72 | 24 | 28 | 2 | 1 | 3.261 | 2 | 0.196 |
| **MC20** | 40 | 37 | 67 | 63 | 2 | 2 | 36 | 42 | 50 | 58 | 2 | 1 | 0.492 | 2 | 0.782 |
| **MC21** | 51 | 48 | 56 | 52 | 2 | 2 | 48 | 56 | 38 | 44 | 2 | 1 | 1.359 | 2 | 0.507 |

## Table F-38
## MC for female respondents

| Question | Web (N = 109) | | | | | | Paper (N = 88) | | | | | | Pearson's chi-2 | df | sig |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | | | |
| | # | % | # | % | # | % | # | % | # | % | # | % | | | |
| **MC22** | 44 | 42 | 61 | 58 | 4 | 4 | 43 | 50 | 43 | 50 | 2 | 1 | 1.348 | 2 | 0.510 |
| **MC23** | 49 | 46 | 58 | 54 | 2 | 2 | 38 | 44 | 48 | 56 | 2 | 1 | 0.142 | 2 | 0.932 |
| **MC24** | 38 | 36 | 69 | 64 | 2 | 2 | 43 | 49 | 44 | 51 | 1 | 1 | 3.830 | 2 | 0.147 |
| **MC25** | 34 | 32 | 73 | 68 | 2 | 2 | 37 | 43 | 49 | 57 | 2 | 1 | 2.683 | 2 | 0.261 |

## Table F-39
## MC for majority respondents

| Question | Web (N = 345) | | | | | | Paper (N = 390) | | | | | | Pearson's Chi-2 | df | sig |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | | | |
| | # | % | # | % | # | % | # | % | # | % | # | % | | | |
| **MC01** | 250 | 72 | 91 | 26 | 6 | 2 | 298 | 76 | 90 | 23 | 2 | 1 | 1.258 | 2 | 0.533 |
| **MC02*** | 294 | 85 | 51 | 15 | 0 | 0 | 365 | 94 | 25 | 6 | 0 | 0 | 14.733 | 2 | 0.001 |
| **MC03** | 320 | 93 | 24 | 7 | 1 | 0 | 370 | 95 | 20 | 5 | 0 | 0 | 1.134 | 2 | 0.567 |
| **MC04** | 282 | 82 | 62 | 18 | 1 | 0 | 325 | 83 | 65 | 17 | 0 | 0 | 0.268 | 2 | 0.874 |
| **MC05** | 237 | 69 | 107 | 31 | 1 | 0 | 279 | 72 | 111 | 28 | 0 | 0 | 0.707 | 2 | 0.702 |
| **MC06** | 248 | 72 | 95 | 28 | 2 | 1 | 292 | 75 | 98 | 25 | 0 | 0 | 0.795 | 2 | 0.672 |
| **MC07** | 295 | 86 | 49 | 14 | 1 | 0 | 358 | 92 | 32 | 8 | 0 | 0 | 6.710 | 2 | 0.035 |
| **MC08** | 262 | 76 | 83 | 24 | 0 | 0 | 295 | 76 | 95 | 24 | 0 | 0 | 0.081 | 2 | 0.961 |
| **MC09** | 243 | 70 | 101 | 29 | 1 | 0 | 304 | 78 | 86 | 22 | 0 | 0 | 5.036 | 2 | 0.081 |
| **MC10** | 213 | 62 | 131 | 38 | 1 | 0 | 236 | 61 | 154 | 39 | 0 | 0 | 0.177 | 2 | 0.915 |
| **MC11** | 220 | 64 | 123 | 36 | 2 | 1 | 275 | 71 | 115 | 29 | 0 | 0 | 3.347 | 2 | 0.188 |
| **MC12** | 231 | 67 | 114 | 33 | 0 | 0 | 277 | 71 | 113 | 29 | 0 | 0 | 1.424 | 2 | 0.491 |
| **MC13** | 261 | 76 | 84 | 24 | 0 | 0 | 305 | 78 | 85 | 22 | 0 | 0 | 0.674 | 2 | 0.714 |
| **MC14** | 249 | 72 | 95 | 28 | 1 | 0 | 282 | 72 | 108 | 28 | 0 | 0 | 0.070 | 2 | 0.966 |
| **MC15** | 126 | 37 | 219 | 63 | 0 | 0 | 163 | 42 | 227 | 58 | 0 | 0 | 2.133 | 2 | 0.344 |
| **MC16** | 250 | 72 | 95 | 28 | 0 | 0 | 291 | 75 | 99 | 25 | 0 | 0 | 0.436 | 2 | 0.804 |
| **MC17** | 236 | 68 | 108 | 31 | 1 | 0 | 259 | 66 | 131 | 34 | 0 | 0 | 0.470 | 2 | 0.791 |
| **MC18** | 197 | 57 | 146 | 42 | 2 | 1 | 222 | 57 | 167 | 43 | 1 | 0 | 0.087 | 2 | 0.957 |
| **MC19** | 258 | 75 | 86 | 25 | 1 | 0 | 295 | 76 | 94 | 24 | 1 | 0 | 0.070 | 2 | 0.966 |
| **MC20** | 180 | 52 | 162 | 47 | 3 | 1 | 215 | 55 | 174 | 45 | 1 | 0 | 0.766 | 2 | 0.682 |
| **MC21** | 251 | 73 | 91 | 26 | 3 | 1 | 287 | 74 | 99 | 25 | 4 | 1 | 0.099 | 2 | 0.952 |

## Table F-39
## MC for majority respondents

| Question | Web (N = 345) | | | | | | Paper (N = 390) | | | | | | Pearson's Chi-2 | df | sig |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | | | |
| | # | % | # | % | # | % | # | % | # | % | # | % | | | |
| **MC22** | 219 | 63 | 122 | 35 | 4 | 1 | 262 | 67 | 123 | 32 | 5 | 1 | 1.395 | 2 | 0.498 |
| **MC23** | 180 | 52 | 160 | 46 | 5 | 1 | 201 | 52 | 181 | 46 | 8 | 2 | 0.390 | 2 | 0.823 |
| **MC24** | 186 | 54 | 154 | 45 | 5 | 1 | 225 | 58 | 156 | 40 | 9 | 2 | 2.098 | 2 | 0.350 |
| **MC25** | 181 | 52 | 155 | 45 | 9 | 3 | 236 | 61 | 145 | 37 | 9 | 2 | 5.209 | 2 | 0.074 |

* Significant difference between paper and web ($p < .01$).

## Table F-40
## MC for minority respondents

| Question | Web (N = 215) | | | | | | Paper (N = 158) | | | | | | Pearson's Chi-2 | df | sig |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | | | |
| | # | % | # | % | # | % | # | % | # | % | # | % | | | |
| **MC01** | 133 | 62 | 82 | 38 | 0 | 0 | 111 | 70 | 47 | 30 | 0 | 0 | 8.299 | 2 | 0.016 |
| **MC02** | 170 | 79 | 45 | 21 | 0 | 0 | 131 | 83 | 27 | 17 | 0 | 0 | 6.674 | 2 | 0.036 |
| **MC03** | 182 | 85 | 32 | 15 | 1 | 0 | 146 | 92 | 12 | 8 | 0 | 0 | 7.430 | 2 | 0.024 |
| **MC04*** | 139 | 65 | 76 | 35 | 0 | 0 | 120 | 76 | 37 | 23 | 1 | 1 | 10.909 | 2 | 0.004 |
| **MC05** | 132 | 61 | 83 | 39 | 0 | 0 | 92 | 58 | 66 | 42 | 0 | 0 | 4.472 | 2 | 0.107 |
| **MC06** | 120 | 56 | 95 | 44 | 0 | 0 | 98 | 62 | 60 | 38 | 0 | 0 | 5.611 | 2 | 0.060 |
| **MC07** | 173 | 81 | 41 | 19 | 1 | 0 | 131 | 83 | 27 | 17 | 0 | 0 | 3.039 | 2 | 0.219 |
| **MC08** | 132 | 62 | 82 | 38 | 1 | 0 | 95 | 60 | 63 | 40 | 0 | 0 | 2.915 | 2 | 0.233 |
| **MC09** | 127 | 59 | 88 | 41 | 0 | 0 | 104 | 66 | 54 | 34 | 0 | 0 | 5.946 | 2 | 0.051 |
| **MC10** | 114 | 54 | 99 | 46 | 2 | 1 | 77 | 49 | 81 | 51 | 0 | 0 | 2.608 | 2 | 0.271 |
| **MC11** | 102 | 48 | 112 | 52 | 1 | 0 | 94 | 59 | 64 | 41 | 0 | 0 | 8.082 | 2 | 0.018 |
| **MC12** | 113 | 53 | 101 | 47 | 1 | 0 | 101 | 64 | 57 | 36 | 0 | 0 | 6.444 | 2 | 0.040 |
| **MC13** | 135 | 63 | 80 | 37 | 0 | 0 | 107 | 68 | 50 | 32 | 1 | 1 | 6.401 | 2 | 0.041 |
| **MC14** | 134 | 62 | 81 | 38 | 0 | 0 | 106 | 68 | 51 | 32 | 1 | 1 | 4.803 | 2 | 0.091 |
| **MC15** | 51 | 24 | 163 | 76 | 1 | 0 | 52 | 33 | 106 | 67 | 0 | 0 | 6.233 | 2 | 0.044 |
| **MC16** | 141 | 66 | 72 | 33 | 2 | 1 | 112 | 71 | 45 | 28 | 1 | 0 | 2.914 | 2 | 0.233 |
| **MC17** | 90 | 43 | 121 | 56 | 4 | 2 | 81 | 52 | 75 | 47 | 2 | 1 | 4.277 | 2 | 0.118 |
| **MC18** | 101 | 47 | 112 | 52 | 2 | 1 | 76 | 48 | 81 | 51 | 1 | 1 | 1.849 | 2 | 0.397 |
| **MC19*** | 126 | 60 | 84 | 39 | 5 | 2 | 119 | 76 | 37 | 23 | 2 | 1 | 11.429 | 2 | 0.003 |
| **MC20** | 89 | 42 | 122 | 57 | 4 | 2 | 81 | 52 | 76 | 48 | 1 | 1 | 3.900 | 2 | 0.142 |
| **MC21** | 113 | 54 | 97 | 45 | 5 | 2 | 91 | 58 | 66 | 42 | 1 | 1 | 0.991 | 2 | 0.609 |

## Table F-40
## MC for minority respondents

| Question | Web (N = 215) | | | | | | Paper (N = 158) | | | | | | Pearson's Chi-2 | df | sig |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | | | |
| | # | % | # | % | # | % | # | % | # | % | # | % | | | |
| **MC22** | 96 | 46 | 113 | 53 | 6 | 3 | 88 | 56 | 68 | 43 | 2 | 1 | 4.321 | 2 | 0.115 |
| **MC23** | 83 | 40 | 123 | 57 | 9 | 4 | 66 | 43 | 88 | 56 | 4 | 3 | 0.499 | 2 | 0.779 |
| **MC24** | 81 | 40 | 123 | 57 | 11 | 5 | 74 | 47 | 82 | 52 | 2 | 1 | 2.263 | 2 | 0.323 |
| **MC25** | 77 | 39 | 123 | 57 | 15 | 7 | 75 | 48 | 80 | 51 | 3 | 2 | 4.049 | 2 | 0.132 |

* Significant difference between paper and web ($p < .01$).

## Table F-41
## AO for all respondents

| Question | Web (N = 721) | | | | | | Paper (N = 644) | | | | | | Pearson's chi-2 | df | sig |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | answered correctly | | answered incorrectly | | missing | | answered correctly | | answered incorrectly | | missing | | | | |
| | # | % | # | % | # | % | # | % | # | % | # | % | | | |
| **AO01*** | 533 | 74 | 185 | 26 | 3 | 0 | 543 | 84 | 101 | 16 | 0 | 0 | 19.895 | 2 | 0.000 |
| **AO02*** | 576 | 80 | 142 | 20 | 3 | 0 | 584 | 91 | 60 | 8 | 0 | 0 | 30.502 | 2 | 0.000 |
| **AO03*** | 577 | 80 | 140 | 20 | 4 | 0 | 582 | 90 | 62 | 10 | 0 | 0 | 26.222 | 2 | 0.000 |
| **AO04*** | 529 | 74 | 188 | 26 | 4 | 0 | 559 | 87 | 85 | 13 | 0 | 0 | 36.645 | 2 | 0.000 |
| **AO05*** | 535 | 75 | 182 | 25 | 4 | 0 | 551 | 86 | 93 | 14 | 0 | 0 | 25.241 | 2 | 0.000 |
| **AO06*** | 553 | 77 | 166 | 23 | 2 | 0 | 540 | 84 | 104 | 16 | 0 | 0 | 10.175 | 2 | 0.006 |
| **AO07*** | 555 | 77 | 162 | 23 | 4 | 0 | 549 | 85 | 94 | 15 | 1 | 0 | 14.030 | 2 | 0.001 |
| **AO08*** | 480 | 67 | 240 | 33 | 1 | 0 | 500 | 78 | 143 | 22 | 1 | 0 | 20.030 | 2 | 0.000 |
| **AO09*** | 482 | 67 | 237 | 33 | 2 | 0 | 480 | 75 | 162 | 25 | 2 | 0 | 9.999 | 2 | 0.007 |
| **AO10** | 507 | 71 | 210 | 29 | 4 | 0 | 494 | 77 | 148 | 23 | 2 | 0 | 6.882 | 2 | 0.032 |
| **AO11** | 381 | 53 | 337 | 47 | 3 | 0 | 377 | 59 | 265 | 41 | 2 | 0 | 4.384 | 2 | 0.112 |
| **AO12** | 534 | 75 | 182 | 25 | 5 | 0 | 515 | 80 | 126 | 20 | 3 | 0 | 5.892 | 2 | 0.053 |
| **AO13*** | 606 | 85 | 109 | 15 | 6 | 0 | 599 | 93 | 45 | 7 | 0 | 0 | 22.232 | 2 | 0.000 |
| **AO14*** | 588 | 82 | 130 | 18 | 3 | 0 | 568 | 88 | 76 | 12 | 0 | 0 | 9.966 | 2 | 0.007 |
| **AO15** | 618 | 86 | 102 | 14 | 1 | 0 | 581 | 90 | 61 | 10 | 2 | 0 | 6.819 | 2 | 0.033 |
| **AO16*** | 554 | 77 | 163 | 23 | 4 | 0 | 556 | 87 | 86 | 13 | 2 | 0 | 18.947 | 2 | 0.000 |
| **AO17*** | 580 | 81 | 140 | 19 | 1 | 0 | 567 | 88 | 76 | 12 | 1 | 0 | 14.501 | 2 | 0.001 |
| **AO18*** | 560 | 78 | 157 | 22 | 4 | 0 | 552 | 86 | 90 | 14 | 2 | 0 | 14.233 | 2 | 0.001 |
| **AO19*** | 511 | 72 | 200 | 28 | 10 | 1 | 510 | 80 | 128 | 20 | 6 | 1 | 11.852 | 2 | 0.003 |
| **AO20*** | 554 | 78 | 157 | 22 | 10 | 1 | 559 | 88 | 76 | 12 | 9 | 1 | 24.700 | 2 | 0.000 |
| **AO21** | 541 | 77 | 164 | 23 | 16 | 2 | 527 | 83 | 105 | 17 | 12 | 1 | 8.905 | 2 | 0.012 |

## Table F-41
## AO for all respondents

| | Web (N = 721) | | | | | | Paper (N = 644) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | answered correctly | | answered incorrectly | | missing | | answered correctly | | answered incorrectly | | missing | | Pearson's | | |
| Question | # | % | # | % | # | % | # | % | # | % | # | % | chi-2 | df | sig |
| **AO22*** | 538 | 76 | 172 | 24 | 11 | 1 | 528 | 84 | 103 | 16 | 13 | 2 | 12.354 | 2 | 0.002 |
| **AO23 *** | 495 | 70 | 210 | 30 | 16 | 2 | 498 | 80 | 127 | 20 | 19 | 3 | 15.434 | 2 | 0.000 |
| **AO24** | 527 | 75 | 174 | 25 | 20 | 2 | 498 | 81 | 120 | 19 | 26 | 4 | 6.061 | 2 | 0.048 |
| **AO25** | 439 | 64 | 250 | 36 | 32 | 4 | 427 | 69 | 189 | 31 | 28 | 4 | 4.426 | 2 | 0.109 |

* Significant difference between paper and web ($p < .01$).

## Table F-42
## AO for male respondents

| Question | Web (N = 534) | | | | | | Paper (N = 510) | | | | | | Pearson's Chi-2 | df | sig |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | | | |
| | # | % | # | % | # | % | # | % | # | % | # | % | | | |
| **AO01*** | 410 | 77 | 122 | 23 | 2 | 0 | 435 | 85 | 75 | 15 | 0 | 0 | 11.472 | 2 | 0.003 |
| **AO02*** | 431 | 81 | 100 | 19 | 3 | 0 | 462 | 91 | 48 | 9 | 0 | 0 | 20.244 | 2 | 0.000 |
| **AO03*** | 431 | 81 | 100 | 19 | 3 | 0 | 462 | 91 | 48 | 9 | 0 | 0 | 19.188 | 2 | 0.000 |
| **AO04*** | 396 | 75 | 135 | 25 | 3 | 0 | 443 | 87 | 67 | 13 | 0 | 0 | 26.151 | 2 | 0.000 |
| **AO05*** | 394 | 74 | 136 | 26 | 4 | 1 | 434 | 85 | 76 | 15 | 0 | 0 | 18.572 | 2 | 0.000 |
| **AO06** | 415 | 78 | 117 | 22 | 2 | 0 | 429 | 84 | 81 | 16 | 0 | 0 | 6.543 | 2 | 0.038 |
| **AO07** | 411 | 78 | 119 | 22 | 4 | 1 | 430 | 84 | 79 | 16 | 1 | 0 | 8.470 | 2 | 0.014 |
| **AO08** | 367 | 69 | 166 | 31 | 1 | 0 | 391 | 77 | 118 | 23 | 1 | 0 | 8.088 | 2 | 0.018 |
| **AO09** | 359 | 67 | 174 | 33 | 1 | 0 | 377 | 74 | 131 | 26 | 2 | 0 | 6.256 | 2 | 0.044 |
| **AO10** | 383 | 72 | 148 | 28 | 3 | 0 | 392 | 77 | 116 | 23 | 2 | 0 | 3.783 | 2 | 0.151 |
| **AO11** | 294 | 55 | 239 | 45 | 1 | 0 | 302 | 59 | 206 | 41 | 2 | 0 | 1.981 | 2 | 0.371 |
| **AO12** | 410 | 77 | 121 | 23 | 3 | 0 | 409 | 81 | 99 | 19 | 2 | 0 | 1.764 | 2 | 0.414 |
| **AO13*** | 450 | 85 | 80 | 15 | 4 | 1 | 469 | 92 | 41 | 8 | 0 | 0 | 13.442 | 2 | 0.001 |
| **AO14** | 442 | 83 | 90 | 17 | 2 | 0 | 454 | 89 | 56 | 11 | 0 | 0 | 7.999 | 2 | 0.018 |
| **AO15** | 461 | 86 | 72 | 14 | 1 | 0 | 459 | 90 | 49 | 10 | 2 | 0 | 3.942 | 2 | 0.139 |
| **AO16** | 422 | 80 | 108 | 20 | 4 | 1 | 435 | 86 | 73 | 14 | 2 | 0 | 6.847 | 2 | 0.033 |
| **AO17** | 435 | 81 | 99 | 19 | 0 | 0 | 448 | 88 | 61 | 12 | 1 | 0 | 8.833 | 2 | 0.012 |
| **AO18** | 424 | 80 | 107 | 20 | 3 | 0 | 434 | 85 | 74 | 15 | 2 | 0 | 5.881 | 2 | 0.053 |
| **AO19** | 380 | 72 | 166 | 28 | 8 | 1 | 401 | 79 | 104 | 21 | 5 | 1 | 7.686 | 2 | 0.021 |
| **AO20*** | 418 | 79 | 108 | 21 | 8 | 1 | 445 | 89 | 57 | 11 | 8 | 1 | 16.716 | 2 | 0.000 |
| **AO21** | 403 | 78 | 117 | 22 | 14 | 2 | 418 | 84 | 81 | 16 | 11 | 2 | 6.768 | 2 | 0.034 |

## Table F-42
## AO for male respondents

| Question | Web (N = 534) | | | | | | Paper (N = 510) | | | | | | Pearson's Chi-2 | df | sig |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | | | |
| | # | % | # | % | # | % | # | % | # | % | # | % | | | |
| **AO22** | 408 | 77 | 119 | 23 | 7 | 1 | 420 | 84 | 78 | 16 | 12 | 2 | 7.684 | 2 | 0.021 |
| **AO23** | 375 | 72 | 147 | 28 | 12 | 2 | 390 | 79 | 102 | 21 | 18 | 3 | 7.491 | 2 | 0.024 |
| **AO24** | 396 | 76 | 124 | 24 | 14 | 2 | 389 | 80 | 98 | 20 | 23 | 4 | 2.567 | 2 | 0.277 |
| **AO25** | 322 | 63 | 191 | 37 | 21 | 4 | 330 | 68 | 155 | 32 | 25 | 4 | 2.963 | 2 | 0.227 |

* Significant difference between paper and web (p < .01).

## Table F-43
## AO for female respondents

| Question | Web (N = 109) | | | | | | Paper (N = 87) | | | | | | Pearson's Chi-2 | df | sig |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | | | |
| | # | % | # | % | # | % | # | % | # | % | # | % | | | |
| **AO01** | 71 | 66 | 37 | 34 | 1 | 1 | 72 | 83 | 15 | 17 | 0 | 0 | 7.422 | 2 | 0.024 |
| **AO02** | 83 | 76 | 26 | 24 | 0 | 0 | 81 | 93 | 6 | 19 | 0 | 0 | 10.426 | 2 | 0.005 |
| **AO03** | 88 | 81 | 21 | 19 | 0 | 0 | 80 | 92 | 7 | 20 | 0 | 0 | 5.152 | 2 | 0.076 |
| **AO04*** | 76 | 70 | 32 | 30 | 1 | 1 | 79 | 91 | 8 | 21 | 0 | 0 | 12.647 | 2 | 0.002 |
| **AO05** | 81 | 74 | 28 | 26 | 0 | 0 | 77 | 89 | 10 | 23 | 0 | 0 | 6.459 | 2 | 0.040 |
| **AO06** | 80 | 73 | 29 | 27 | 0 | 0 | 71 | 82 | 16 | 29 | 0 | 0 | 2.004 | 2 | 0.367 |
| **AO07** | 86 | 79 | 23 | 21 | 0 | 0 | 81 | 93 | 6 | 19 | 0 | 0 | 7.954 | 2 | 0.019 |
| **AO08*** | 65 | 60 | 44 | 40 | 0 | 0 | 73 | 84 | 14 | 27 | 0 | 0 | 14.059 | 2 | 0.001 |
| **AO09** | 68 | 63 | 40 | 37 | 1 | 1 | 67 | 77 | 20 | 33 | 0 | 0 | 4.724 | 2 | 0.094 |
| **AO10** | 69 | 64 | 39 | 36 | 1 | 1 | 67 | 77 | 20 | 33 | 0 | 0 | 4.178 | 2 | 0.124 |
| **AO11** | 53 | 49 | 56 | 51 | 0 | 0 | 50 | 57 | 37 | 50 | 0 | 0 | 1.997 | 2 | 0.368 |
| **AO12*** | 67 | 63 | 40 | 37 | 2 | 2 | 73 | 84 | 14 | 27 | 0 | 0 | 10.843 | 2 | 0.004 |
| **AO13** | 91 | 85 | 16 | 15 | 2 | 2 | 85 | 98 | 2 | 15 | 0 | 0 | 9.142 | 2 | 0.010 |
| **AO14** | 91 | 84 | 17 | 16 | 1 | 1 | 74 | 85 | 13 | 26 | 0 | 0 | 0.092 | 2 | 0.955 |
| **AO15** | 93 | 85 | 16 | 15 | 0 | 0 | 79 | 91 | 8 | 21 | 0 | 0 | 1.832 | 2 | 0.400 |
| **AO16*** | 76 | 70 | 33 | 30 | 0 | 0 | 79 | 91 | 8 | 21 | 0 | 0 | 13.455 | 2 | 0.001 |
| **AO17** | 87 | 81 | 21 | 19 | 1 | 1 | 79 | 91 | 8 | 21 | 0 | 0 | 4.063 | 2 | 0.131 |
| **AO18** | 84 | 77 | 25 | 23 | 0 | 0 | 79 | 91 | 8 | 21 | 0 | 0 | 6.993 | 2 | 0.030 |
| **AO19*** | 75 | 69 | 34 | 31 | 0 | 0 | 75 | 87 | 11 | 25 | 1 | 1 | 10.341 | 2 | 0.006 |
| **AO20** | 82 | 76 | 26 | 24 | 1 | 1 | 76 | 88 | 10 | 24 | 1 | 1 | 5.346 | 2 | 0.069 |
| **AO21** | 81 | 75 | 27 | 25 | 1 | 1 | 73 | 85 | 13 | 27 | 1 | 1 | 3.300 | 2 | 0.192 |

## Table F-43
## AO for female respondents

| | Web (N = 109) | | | | | | Paper (N = 87) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | Pearson's | | |
| Question | # | % | # | % | # | % | # | % | # | % | # | % | Chi-2 | df | sig |
| **AO22** | 79 | 74 | 28 | 26 | 2 | 2 | 73 | 85 | 13 | 27 | 1 | 1 | 3.570 | 2 | 0.168 |
| **AO23** | 77 | 72 | 30 | 28 | 2 | 2 | 71 | 83 | 15 | 29 | 1 | 1 | 3.083 | 2 | 0.214 |
| **AO24** | 76 | 73 | 28 | 27 | 5 | 4 | 73 | 86 | 12 | 27 | 2 | 2 | 4.650 | 2 | 0.098 |
| **AO25** | 72 | 72 | 28 | 28 | 9 | 8 | 64 | 75 | 21 | 36 | 2 | 2 | 1.543 | 2 | 0.462 |

* Significant difference between paper and web (p < .01).

## Table F-44
## AO for majority respondents

| Question | Web (N = 343) | | | | | | Paper (N = 390) | | | | | | Pearson's Chi-2 | df | sig |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | | | |
| | # | % | # | % | # | % | # | % | # | % | # | % | | | |
| **AO01*** | 261 | 76 | 82 | 24 | 0 | 0 | 344 | 88 | 46 | 12 | 0 | 0 | 19.777 | 2 | 0.000 |
| **AO02*** | 276 | 81 | 66 | 19 | 1 | 0 | 359 | 92 | 31 | 8 | 0 | 0 | 20.770 | 2 | 0.000 |
| **AO03*** | 268 | 78 | 74 | 22 | 1 | 0 | 353 | 91 | 37 | 9 | 0 | 0 | 21.504 | 2 | 0.000 |
| **AO04*** | 254 | 74 | 88 | 26 | 1 | 0 | 343 | 88 | 47 | 12 | 0 | 0 | 23.193 | 2 | 0.000 |
| **AO05*** | 254 | 74 | 87 | 25 | 2 | 1 | 337 | 86 | 53 | 14 | 0 | 0 | 17.065 | 2 | 0.000 |
| **AO06** | 262 | 77 | 87 | 25 | 2 | 1 | 326 | 84 | 64 | 16 | 0 | 0 | 5.720 | 2 | 0.057 |
| **AO07** | 262 | 77 | 79 | 23 | 2 | 1 | 332 | 85 | 57 | 15 | 1 | 0 | 8.827 | 2 | 0.012 |
| **AO08** | 239 | 70 | 81 | 24 | 0 | 0 | 306 | 79 | 83 | 21 | 1 | 0 | 7.810 | 2 | 0.020 |
| **AO09** | 231 | 68 | 110 | 32 | 2 | 1 | 295 | 76 | 93 | 24 | 2 | 1 | 6.465 | 2 | 0.039 |
| **AO10** | 256 | 75 | 86 | 25 | 1 | 0 | 311 | 80 | 78 | 20 | 1 | 0 | 3.023 | 2 | 0.221 |
| **AO11** | 195 | 57 | 148 | 43 | 0 | 0 | 237 | 61 | 151 | 39 | 2 | 1 | 1.352 | 2 | 0.509 |
| **AO12** | 260 | 76 | 82 | 24 | 1 | 1 | 315 | 81 | 73 | 19 | 2 | 1 | 2.829 | 2 | 0.243 |
| **AO13*** | 288 | 85 | 52 | 15 | 3 | 1 | 363 | 93 | 27 | 7 | 0 | 0 | 14.520 | 2 | 0.001 |
| **AO14** | 280 | 82 | 61 | 18 | 2 | 1 | 347 | 89 | 43 | 11 | 0 | 0 | 7.919 | 2 | 0.019 |
| **AO15** | 301 | 88 | 41 | 12 | 1 | 0 | 355 | 91 | 35 | 9 | 0 | 0 | 2.314 | 2 | 0.314 |
| **AO16** | 272 | 80 | 69 | 20 | 2 | 1 | 339 | 87 | 51 | 13 | 0 | 0 | 7.690 | 2 | 0.021 |
| **AO17*** | 277 | 81 | 66 | 19 | 0 | 0 | 347 | 89 | 43 | 11 | 0 | 0 | 9.982 | 2 | 0.007 |
| **AO18** | 274 | 80 | 67 | 20 | 2 | 1 | 340 | 87 | 49 | 13 | 1 | 0 | 7.283 | 2 | 0.026 |
| **AO19*** | 241 | 71 | 99 | 29 | 3 | 1 | 319 | 82 | 69 | 18 | 2 | 1 | 13.625 | 2 | 0.001 |
| **AO20*** | 270 | 79 | 71 | 21 | 2 | 1 | 347 | 90 | 39 | 10 | 4 | 1 | 16.205 | 2 | 0.000 |
| **AO21** | 266 | 79 | 70 | 20 | 7 | 2 | 327 | 85 | 58 | 15 | 5 | 1 | 4.895 | 2 | 0.087 |

## Table F-44
## AO for majority respondents

| Question | Web (N = 343) | | | | | | Paper (N = 390) | | | | | | Pearson's Chi-2 | df | sig |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | | | |
| | # | % | # | % | # | % | # | % | # | % | # | % | | | |
| **AO22** | 267 | 79 | 73 | 21 | 3 | 1 | 326 | 85 | 57 | 15 | 7 | 2 | 5.356 | 2 | 0.069 |
| **AO23** | 249 | 73 | 92 | 27 | 2 | 1 | 308 | 81 | 71 | 18 | 11 | 3 | 8.172 | 2 | 0.017 |
| **AO24** | 270 | 79 | 70 | 20 | 3 | 1 | 313 | 83 | 63 | 16 | 14 | 4 | 3.517 | 2 | 0.172 |
| **AO25** | 220 | 66 | 113 | 33 | 10 | 3 | 267 | 71 | 107 | 27 | 16 | 4 | 2.450 | 2 | 0.294 |

* Significant difference between paper and web ($p < .01$).

## Table F-45
## AO for minority respondents

| Question | Web (N = 213) | | | | | | Paper (N = 158) | | | | | | Pearson's Chi-2 | df | sig |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | | | |
| | # | % | # | % | # | % | # | % | # | % | # | % | | | |
| **AO01** | 152 | 72 | 59 | 28 | 2 | 1 | 124 | 78 | 34 | 22 | 0 | 0 | 3.004 | 2 | 0.223 |
| **AO02** | 165 | 78 | 46 | 22 | 2 | 1 | 140 | 89 | 18 | 11 | 0 | 0 | 8.294 | 2 | 0.016 |
| **AO03** | 176 | 83 | 36 | 17 | 1 | 0 | 142 | 90 | 16 | 10 | 0 | 0 | 5.238 | 2 | 0.073 |
| **AO04*** | 152 | 72 | 59 | 28 | 2 | 1 | 136 | 86 | 22 | 14 | 0 | 0 | 10.878 | 2 | 0.004 |
| **AO05** | 152 | 71 | 61 | 29 | 0 | 0 | 130 | 82 | 28 | 18 | 0 | 0 | 7.076 | 2 | 0.029 |
| **AO06** | 162 | 76 | 51 | 24 | 0 | 0 | 132 | 84 | 26 | 16 | 0 | 0 | 4.248 | 2 | 0.120 |
| **AO07** | 158 | 75 | 53 | 25 | 2 | 1 | 134 | 85 | 24 | 15 | 0 | 0 | 5.707 | 2 | 0.058 |
| **AO08*** | 131 | 62 | 81 | 38 | 1 | 0 | 122 | 77 | 36 | 23 | 0 | 0 | 10.599 | 2 | 0.005 |
| **AO09** | 133 | 62 | 80 | 38 | 0 | 0 | 112 | 71 | 46 | 29 | 0 | 0 | 4.041 | 2 | 0.133 |
| **AO10** | 134 | 64 | 77 | 36 | 2 | 1 | 113 | 72 | 45 | 28 | 0 | 0 | 3.476 | 2 | 0.176 |
| **AO11** | 111 | 52 | 101 | 47 | 1 | 0 | 88 | 56 | 70 | 44 | 0 | 0 | 1.069 | 2 | 0.586 |
| **AO12** | 157 | 75 | 53 | 25 | 3 | 1 | 126 | 80 | 32 | 20 | 0 | 0 | 1.373 | 2 | 0.503 |
| **AO13** | 176 | 84 | 34 | 16 | 3 | 1 | 147 | 93 | 11 | 7 | 0 | 0 | 7.260 | 2 | 0.027 |
| **AO14** | 173 | 82 | 39 | 18 | 1 | 0 | 139 | 88 | 19 | 12 | 0 | 0 | 3.437 | 2 | 0.179 |
| **AO15** | 173 | 81 | 40 | 19 | 0 | 0 | 137 | 88 | 19 | 12 | 2 | 1 | 5.463 | 2 | 0.065 |
| **AO16** | 155 | 73 | 57 | 27 | 1 | 0 | 131 | 84 | 25 | 16 | 2 | 1 | 7.885 | 2 | 0.019 |
| **AO17** | 169 | 79 | 44 | 21 | 0 | 0 | 134 | 85 | 23 | 15 | 1 | 1 | 4.005 | 2 | 0.135 |
| **AO18** | 157 | 74 | 56 | 26 | 0 | 0 | 130 | 83 | 27 | 17 | 1 | 1 | 7.238 | 2 | 0.027 |
| **AO19** | 146 | 70 | 64 | 30 | 3 | 1 | 122 | 79 | 32 | 20 | 4 | 3 | 6.063 | 2 | 0.048 |
| **AO20** | 156 | 75 | 53 | 25 | 4 | 2 | 129 | 84 | 24 | 15 | 5 | 3 | 7.673 | 2 | 0.022 |
| **AO21** | 153 | 74 | 54 | 25 | 6 | 3 | 123 | 81 | 29 | 18 | 6 | 4 | 4.457 | 2 | 0.108 |

## Table F-45
## AO for minority respondents

| Question | Web (N = 213) | | | | | | Paper (N = 158) | | | | | | Pearson's Chi-2 | df | sig |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Answered correctly | | Answered incorrectly | | Missing | | Answered correctly | | Answered incorrectly | | Missing | | | | |
| | # | % | # | % | # | % | # | % | # | % | # | % | | | |
| **AO22** | 151 | 72 | 58 | 27 | 4 | 2 | 123 | 80 | 30 | 19 | 5 | 3 | 4.960 | 2 | 0.084 |
| **AO23** | 144 | 71 | 60 | 28 | 9 | 4 | 119 | 79 | 32 | 20 | 7 | 4 | 3.672 | 2 | 0.159 |
| **AO24** | 137 | 68 | 64 | 30 | 12 | 6 | 108 | 73 | 40 | 25 | 10 | 6 | 1.707 | 2 | 0.426 |
| **AO25** | 116 | 59 | 81 | 38 | 16 | 8 | 98 | 66 | 51 | 32 | 9 | 6 | 1.710 | 2 | 0.425 |

* Significant difference between paper and web ($p < .01$).

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